AGRICULTURAL *Chemicals*

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- Alabama Pesticide Meeting
- Formulation of Pesticides
- APPLICATOR SECTION

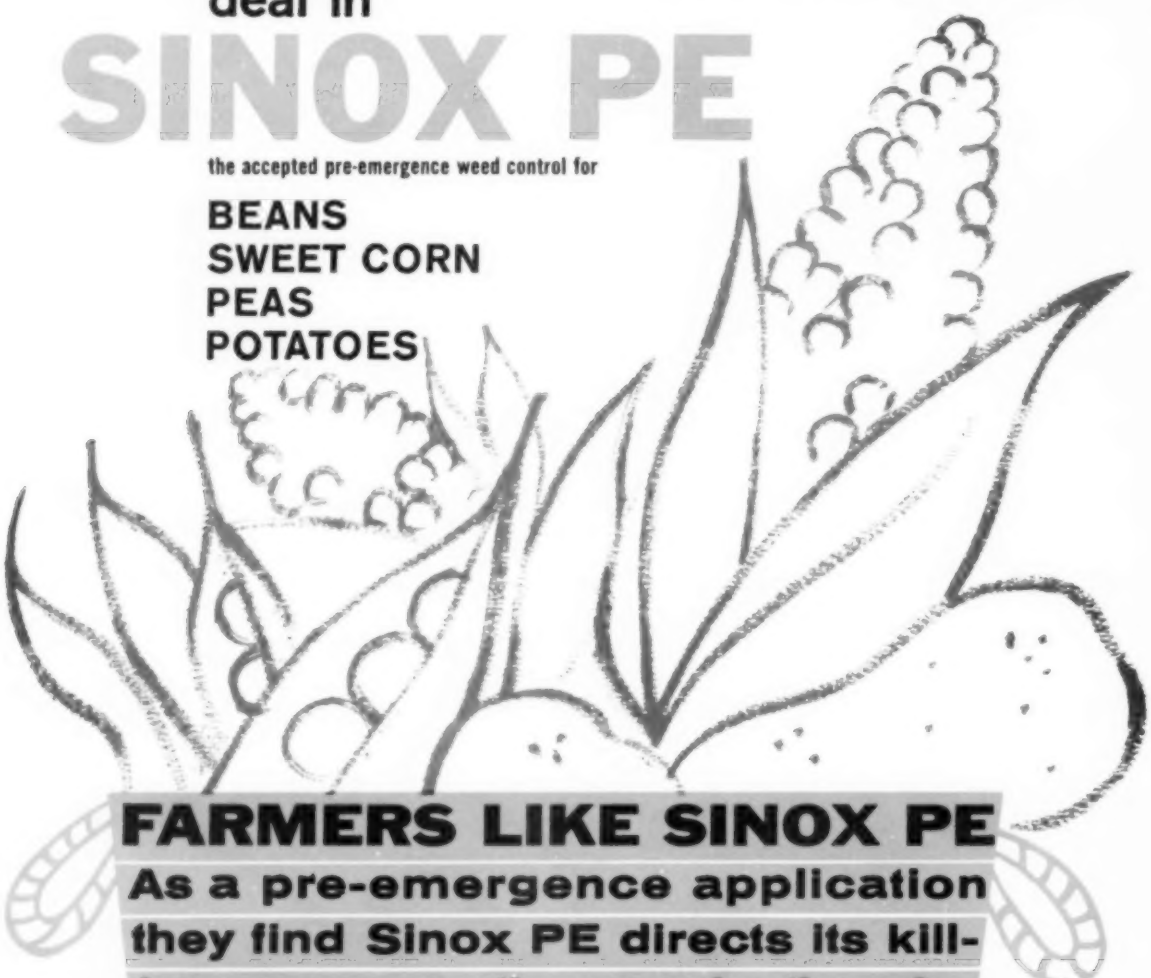
MARCH, 1960

This year make your full weed control profits deal in

SINOX PE

the accepted pre-emergence weed control for

BEANS
SWEET CORN
PEAS
POTATOES



FARMERS LIKE SINOX PE

As a pre-emergence application they find Sinox PE directs its killing power on the weeds, thereby conserving soil moisture and fertilizer for the crop. They have made it their first choice.

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as a leading agricultural chemical, it's nationally advertised and pre-sold to your customers.

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In many ways

a farm indispensable...

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Triangle Brand Copper Sulfate

Triangle Brand Copper Sulfate is used

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- *in feeds as a dietary supplement*
- *in fungicides because it's compatible*

For information on formulating Triangle Brand Copper Sulfate into your farm products, write

Phelps Dodge Refining Corporation

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This Month's Cover

A new parasitic plant in the U. S. is witchweed, with primary hosts: corn, sorghum and sugarcane. In the picture an inspector is examining a corn root ball of a corn plant severely damaged by witchweed. The symptoms resemble those produced by an acute drought. See story on pages 42-44.

Vol. 15, No. 3 March, 1960

AGRICULTURAL *Chemicals*

ARTICLES

FEATURES

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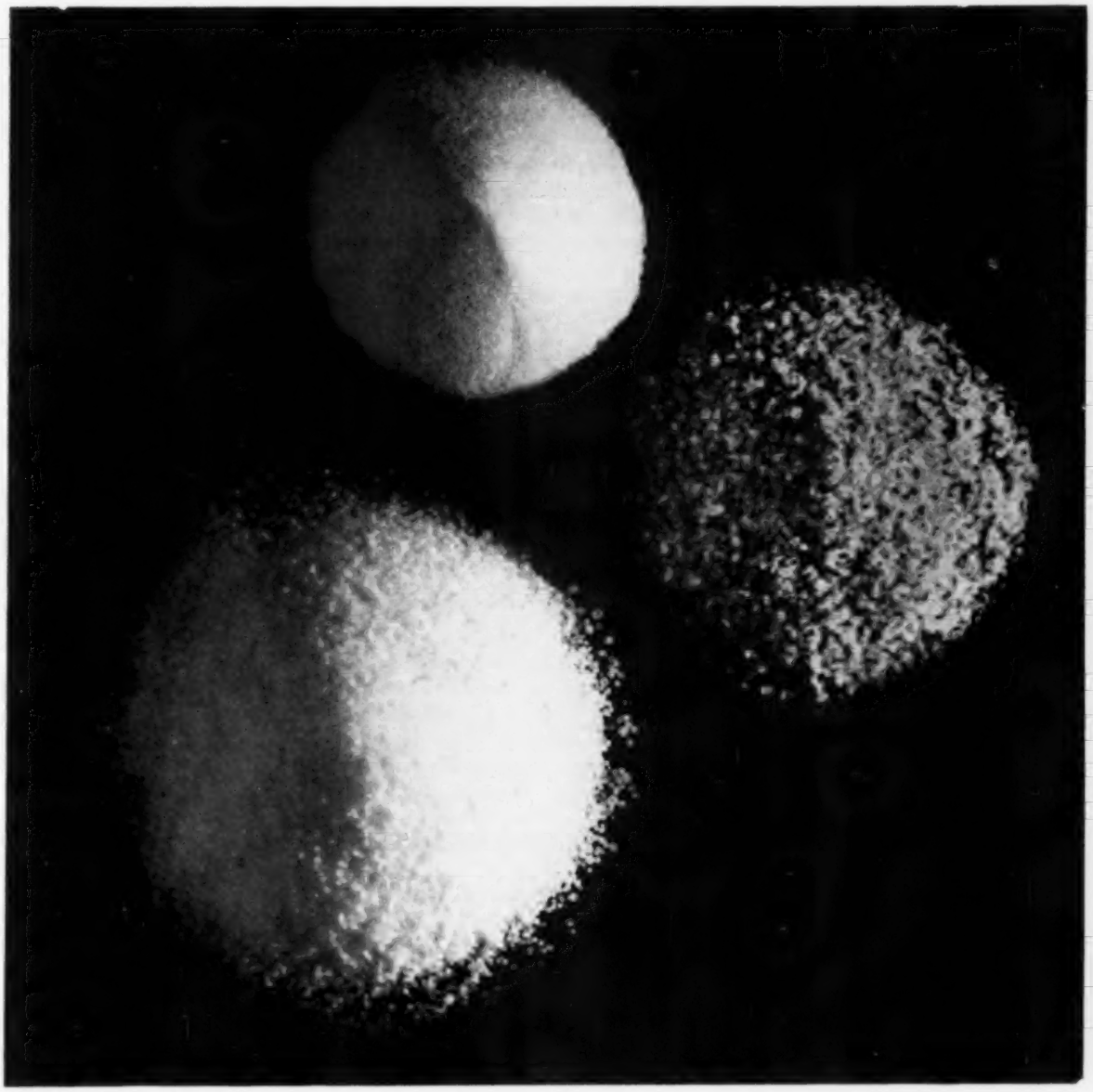
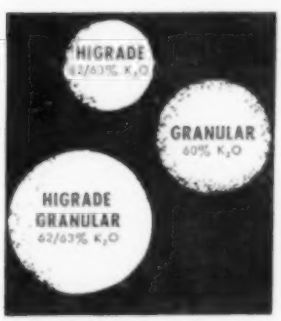


To help you make better fertilizers... three grades of specially-sized potash



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A.I.Ch.E. holds Pesticide Symposium

THE "pesticide business," – its potentials, current and past problems, marketing structure, achievements, history, etc., were reviewed by J. V. Vernon, Food Machinery & Chemical Corp., in an address before the national meeting of the American Institute of Chemical Engineers, held February 22nd in Atlanta, Ga. Mr. Vernon was the "lead off" speaker of a panel of pesticide industry experts participating in a Pesticide Symposium.

The material presented by the panel represents an invaluable compilation, reviewing all phases of pesticide manufacture, research and development.

"The pesticide industry today has sales approximating $280 million,–a far cry from the $30 million recorded just 25 years ago," Mr. Vernon told the engineers. By 1975, estimates Mr. Vernon, "our industry will do a billion dollars in sales volume. For the most part," he added, "ours is not a 'glamour industry', now,–but it certainly has all the elements present to make it one."

Development of a Pesticide

R. H. Wellman, Union Carbide Chemicals Co., New York, outlined the costs of proving the usefulness of a pesticide,–estimating the price tag in the neighborhood of some $1,274,000, excluding toxicological work or investment in a plant to produce the pesticide.

This figure supplemented Jack Vernon's earlier observation that the pesticide industry invests some $30 million a year in the search for new and better agricultural chemical products. The risk on this investment, he pointed out, is further increased by a time lag of some two or three years, required for testing the new product to satisfy government requirements, state requirements and company standards.

"Even after all the biological research is completed by both public and private agencies," added Mr. Wellman," the pesticide is not yet available in quantity to the grower. The activities which must accompany and follow the research testing program are: process development pilot plant studies and adequate engineering of large scale production facilities."

Mr. Wellman summarized some of the factors to be considered in the development of a pesticide to include: Market study, timing, physical and chemical properties, formulation, biological activity, product specifications, toxicological data and residues, labeling, patent considerations, and merchandising.

History of DDT Insecticides

"It can be conservatively stated that DDT, which triggered organic pesticide production where none existed before, contributed more to the pesticide industry than any chemical before or since," observed John G. Plowden, Geigy Chemical Corp., New York, in presenting a history of DDT insecticides.

"An indication of the importance of DDT to the pesticide industry today," he added, "is clearly shown by 1958 pesticide production figures. "A total of 466,000,000 pounds of all types of pesticides were produced and sold for $196 million. Of this, 145 million pounds was technical DDT, which sold for $27 million. Technical DDT accounted for 31% of production and 14% of the sales of pesticides.–Quite a sizeable portion of the market for a chemical that has been in use for 15 years."

Earlier comments by Mr. Plowden reviewed research leading to the discovery of DDT, its history, early manufacture, processes and subsequent improvements.

Commenting on marketing DDT, Mr. Plowden stated, "It would be pleasant to report that DDT insecticides over the years have been marketed on a sound and business-like manner. Unfortunately, this has not been the case. The practice of consigning products started in 1950, and certain manufacturers still continue this practice today.

"DDT as such is useless, and for insecticidal use, it is necessary for the DDT to be converted from its technical state into a formulation. The formulations used have varied over the years with area and crop. The fruit farmers have preferred a 50 to 75% wettable powder, the corn farmers of the corn belt a 25% emulsifiable solution, the sweet corn farmers of Florida a 7½ to 15% dust, the cotton farmers either a 5 to 10% dust or an emulsifiable solution.

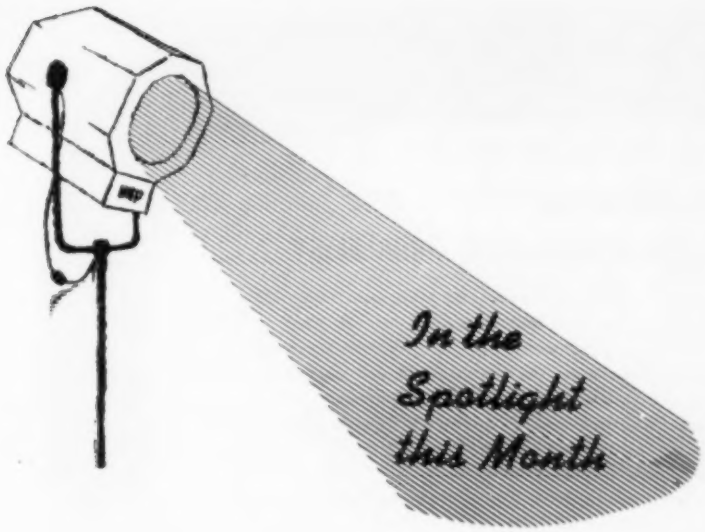
"Today, there are eight companies who offer for sale DDT in its technical form. Some of these companies are integrated in their operation. By this we mean that while offering technical DDT for sale to second parties, they convert a portion of it into finished insecticides for sale through their normal outlets. Other companies are dependent solely on independent formulators or convertors for their market. It is of interest to note that the majority of these formulators have entered the insecticide picture only since the advent of the organic chemicals which could be used in pest control."

Expressing a confidence in the future of DDT, Mr. Plowden remarked that although replacement of DDT by other chemicals in insect control is a possibility, "such a new chemical will have to be a 'world beater' to replace it completely."

Industrial Hygiene Control

The marketing of DDT and other chlorinated hydrocarbon insecticides introduced a group of products not only more toxic to insects but also of greater toxicity to man than the early inorganic insecticides, which included pri-

(*Continued on Page* 38)



- **Witchweed** . . . A new parasitic plant in the United States is witchweed, threatening corn, sorghum and sugarcane crops, which represent an annual value of five billion dollars. The federal government has a large weed eradication program underway in the Carolinas to control this pest. The program combines both cultural and chemical controls, using 2,4-D. Page 42.

- **Liquid Fertilizers** . . . Growing use of liquid mixed fertilizers may be expected in keeping with modern technology. A discussion of agronomic values, costs of production, economics in application, corrosion problems in handling, etc., is directed to manufacturers and extension workers in the southeast in preparation for development of the liquid fertilizer market in this area. Page 46.

- **Pesticides are Safe** . . . Several discussions this month concern the toxicity of pesticides on food crops. At a meeting of Chemical Engineers, J. V. Vernon states that "the strict requirements of both federal and state laws are adequate to protect the American people from any harmful effects." (page 35). In view of FDA's ruling of a zero tolerance on Heptachlor, USDA clarifies approved methods for the use of this pesticide on food crops (page 40). More discussion of the cranberry situation appears on page 34.

- **Ammonium Sulfate** . . . Free ammonia content of nitrogen solutions offers the most serious competition to sulfate of ammonia in the fertilizer market. Sulfate of ammonia producers, however, should exploit the special advantages of their product in the production of mixed fertilizers. In addition to the sulfur content,—a nutrient "extra"—ammonium sulfate offers granular fertilizer manufacturers properties for well controlled granulation. Page 30.

- **Pesticide Formulation** . . . Because of the seasonal nature of the pesticide business, formulation plants are usually overdesigned (and overworked) so that they can put out a year's production in the space of a few months. Typical plant design and pesticide formulas are outlined in this article, presented as part of the Pesticide Symposium before the American Institute of Chemical Engineers. Page 35.

Our Principals, Montecatini Soc. Gen. in Milan, Italy, have read with interest about Rogor in the list of new pesticides, on page 93 of the March 1959 issue of your magazine.

They would like to bring to your attention and, for the sake of accuracy, to the attention of your readers that the active ingredient of Rogor is N-monomethylamide of O,O-dimethyldithiophosphorylacetic acid and not N-ethyl-O, O, dimethyldichlorophosphoryo acetamide.

We believe there was some misprinting and hope that the readers of your magazine will be informed accordingly.

Thanking you for your cooperation, we remain

Elia Palmese
CHEMORE CORPORATION
Representative of
Montecatini Soc. Gen.
Milan, Italy

In one of the issues of "Agricultural Chemicals," last year, there was an article regarding the manufacture of a set of clothes for spraying with harmful materials which can be worn once and thrown away.

Unfortunately, we have discarded our copy of this issue, and would greatly appreciate receiving any information you might be able to send us on where we might procure this item.

Incidentally, we look forward to receiving our copy of "Agricultural Chemicals," each month.

H. E. Minahen, Mgr.
LINDEN WALNUT ASSOCIATION
Linden, California

I read with great interest in your December issue an abridged report on page 45 of Mr. Baranowski's experiments with mixed insecticides on leaf miners.

I would like more information on his report, and as a further favor any other available sources of information on the subject. I will be obliged to you for providing me with addresses of persons or stations who to your knowledge have carried out such experiments.

Harry Baumann
MESHEK DALIAH
Post Daliah, Israel

Would readers working with leaf miners exchange information directly with Mr. Baumann.

I would appreciate it if you would give me the address of a concern selling activated charcoal in commercial quantities, as I could use it as a de-odorant in my business.

Daytona Beach, Fla.

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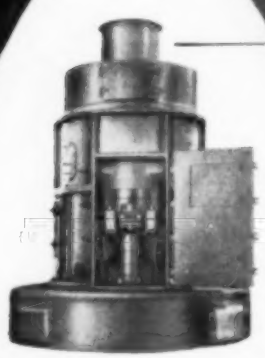
Then you're looking for a Bradley Pneumatic Hercules Mill. Because the Bradley Pneumatic Mill is installed on a foundation flush with the floor line, it not only reduces foundation costs but simplifies inspection and maintenance. Grinding parts are also easily accessible . . . both grinding die ring and roll assemblies can be removed without dismantling the mill. And the mill's durable, nonclogging vibratory feeder and electrical control eliminate manual feeding . . . allow continuous operation of the mill. Add rugged construction to this, and you have a mill which produces a uniform grind from 20 to 325 mesh with an absolute minimum of replacements and downtime.



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P-4

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SIMAZINE HERBICIDE
Pre-emergence herbicide for use on corn. One application gives season-long effective weed control. Safe to corn. Performs best in areas where rainfall is normally expected 10 to 14 days after planting. Also for pre-emergence use on nursery stock, and at higher levels of application, as an industrial herbicide. Extremely low toxicity to humans and animals.

Geigy
METHOXYCHLOR INSECTICIDE
Multi-purpose insecticide. Long residual action against many insect species attacking fruit, vegetable, forage crops, and stored grain. Controls horn flies, cattle lice and ticks on livestock.

ATRAZINE HERBICIDE
New pre-emergence herbicide for use on corn. Higher solubility than Simazine. Recommended especially for use in drier areas. One application provides season-long weed control. Safe to corn. Extremely low toxicity to humans and animals. At higher dosage rates, Atrazine is used as a non-selective pre- or post-emergence herbicide for industrial weed control.

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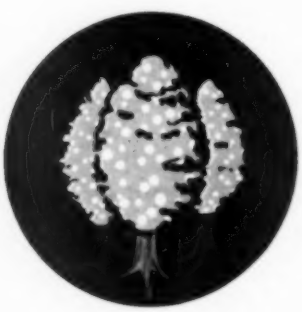
Safe, effective miticide for use on deciduous and citrus fruit, ornamentals and nursery stock. Long residual action.



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All SPENSOLS remain fluid at lower temperatures than other solutions with comparable nitrogen content:

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You get many other advantages with SPENSOL, too. For example, you will never receive a car of SPENSOL GREEEN that falls below the nitrogen guarantee. The overage, at no cost to you, gives you an extra advantage in producing products that will exceed the guarantee. But that's not all . . . .

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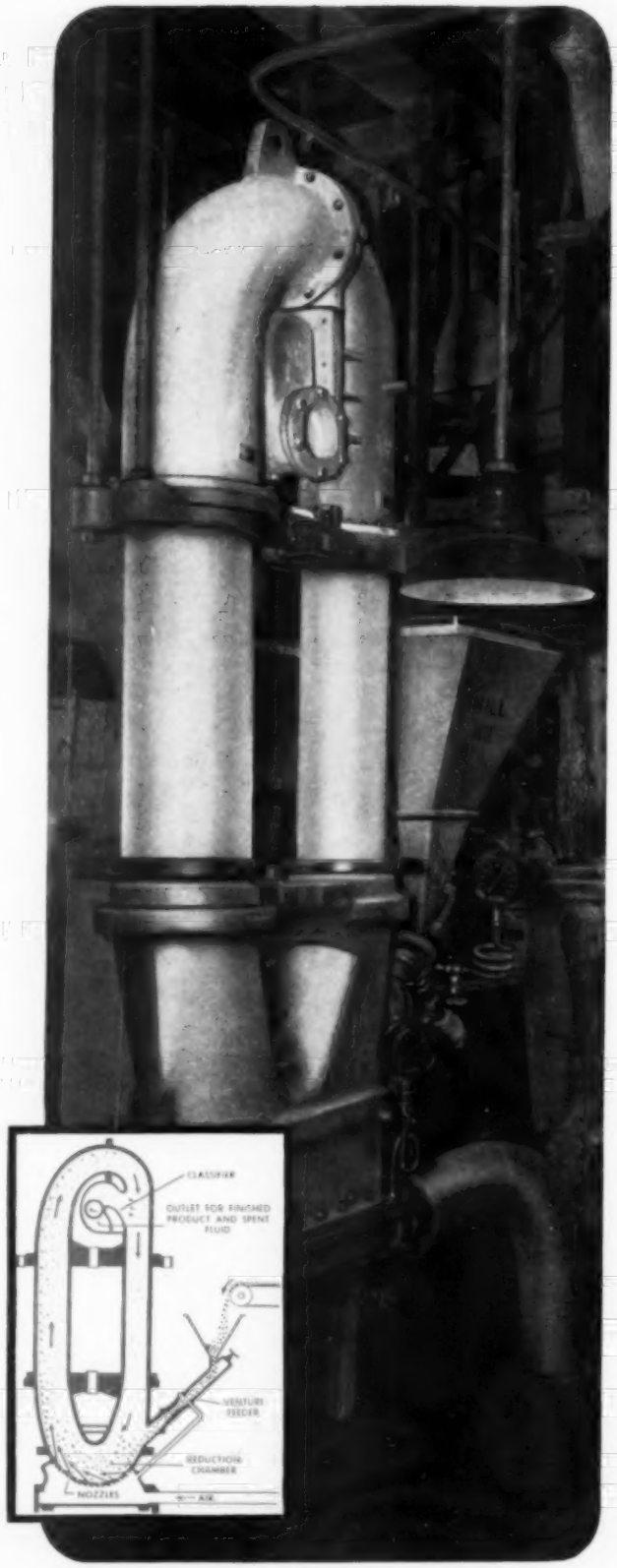

A typical Fluid Energy Mill installation, in continuous operation for more than ten years.

MEETING CALENDAR

March 1-2—Western Cotton Producers' Conf., Bakersfield Hacienda, Bakersfiield, Calif.

March 22-23—Western Agricultural Chemicals Asso., Miramar Hotel, Santa Barbara, Calif.

March 23-25—North Central Branch, Entomological Socety of America, Schroeder Hotel, Milwaukee, Wisc.

March 30-31—Georgia Entomological Society, 24th annual meeting, New Science Center, University of Georgia, Athens.

April 4-7—National Packaging Exposition, Convention Hall, Atlantic City, N. J.

April 5-9—American Chemical Society, general assembly in Cleveland, Ohio.

Apr. 6-7—LSU Forestry Symposium, Louisiana State Univ., Baton Rouge.

April 11-12 — California Fertilizer Conf., Fresno State College, Fresno, Calif.

June 12-15 — National Plant Food Institute, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

June 21-22—Southern Feed & Fertilizer Control Officials, Riverside Hotel, Gatlinburg, Tenn.

June 27-29 — Pacific Branch, Entomological Society of America, Davenport Hotel, Spokane, Wash.

July 13-15—Fertilizer Conf. of the Pacific Northwest, Hotel Utah, Salt Lake City.

July 27-30 — Southwest Fertilizer Conf. and Grade Hearing, Galvez Hotel, Galveston, Tex.

Sept. 11-14—Canadian Agricultural Chemicals Association, Britannia Lodge, Muskoka, Ontario, Canada.

Sept. 29-30 — Northeast Fertilizer Conf., Hotel Hershey, Hershey, Pa.

Oct. 5-6—Southeast Fertilizer Conf., Atlanta Biltmore Hotel, Atlanta, Ga.

Oct. 17-18—Fertilizer Section, National Safety Congress, Chicago.

Oct. 25-27 — National Agricultural Chemicals Association, Calif., del Coronado Hotel, Coronado, Calif.

Nov. 3-4—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 13-15 — California Fertilizer Assn., del Coronado Hotel, Coronado, Calif.

Dec. 5-7—Carolinas-Virginia Pesticide Formulators Assn. annual meeting, Carolina Hotel, Pinehurst, N. C.

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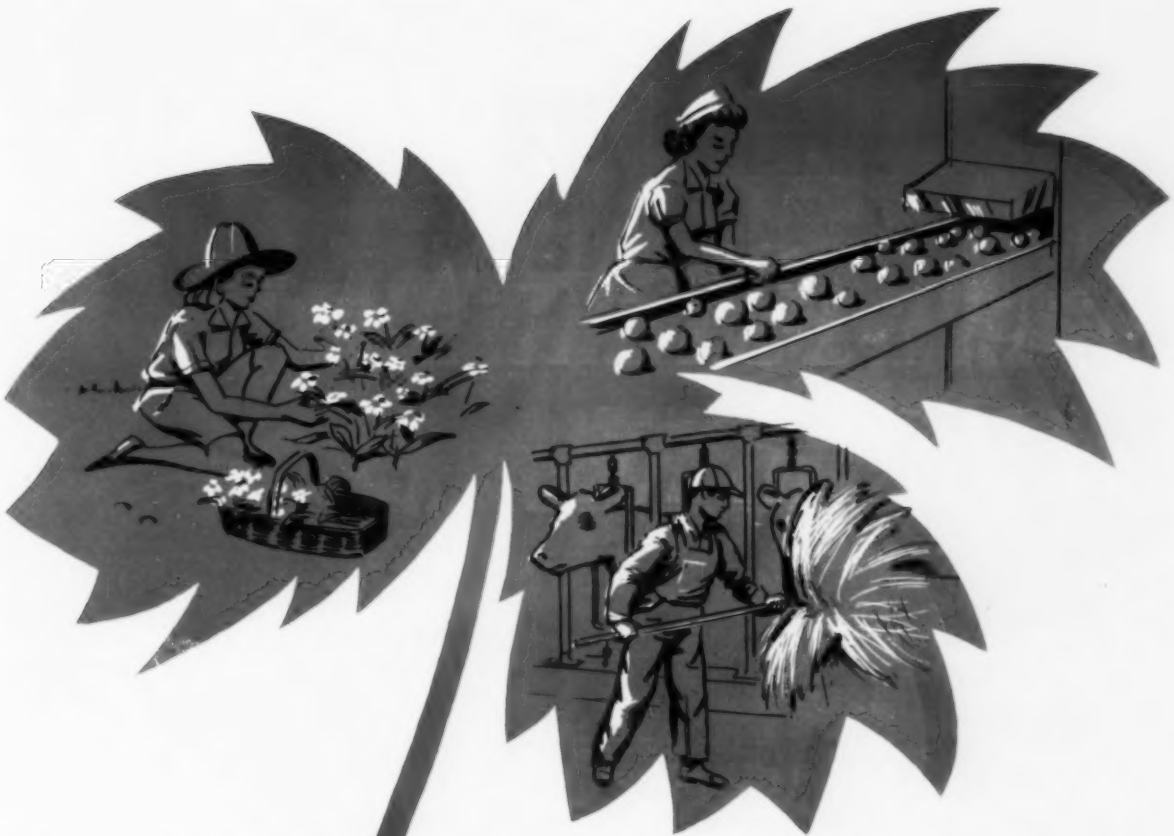

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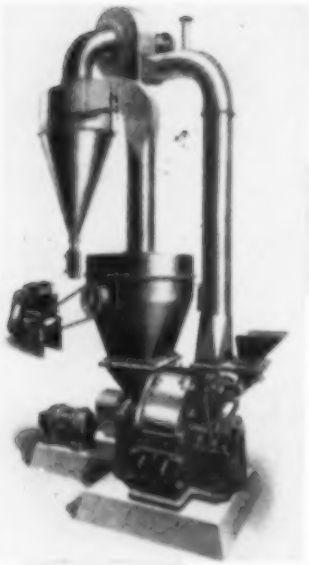

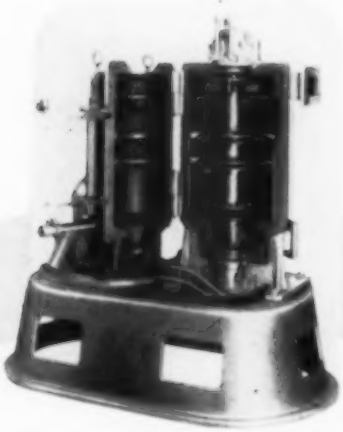

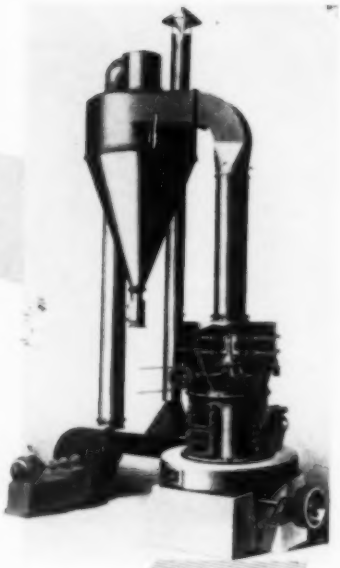

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GRINDING MILLS

IMP MILL, left — ROLLER MILL, right
VERTICAL MILL, center
Equipped with Whizzer Air Separation

THE Raymond line of Mills provides a range of sizes and types of machines for large and small plants as well as for handling the many different pulverizing problems in the production of modern insecticides.

Whizzer air separation combined with automatic dust-free operation insures easy fineness control with a uniform quality product and a clean economical system that keeps your costs at record low levels.

RAYMOND IMP MILL—A simple, compact unit requiring minimum floor space. Efficient for making field strength and low concentrate formulations. Widely used on organic insecticides, especially in medium size plants. Economical for processing DDT, BHC, toxaphene and similar concentrates, also wettable powders, with recommended fillers.

RAYMOND VERTICAL MILL—Specially designed for producing extremely fine finished material in the sub-sieve particle sizes. The open view, above, shows how the full length hinged doors give easy access for inspection, adjustment or clean-out. An excellent unit for handling concentrates of 50% or higher, delivering a uniform, thoroughly blended product.

RAYMOND ROLLER MILL—A large capacity multi-purpose mill with the ability to handle all types of concentrate formulations and very fine field strength dusts, as well as sulphur-bearing products, with clean dust-free operation. This slow speed, cool running unit gives good results on materials that have a tendency to become sticky in grinding, thus eliminating build-ups in the mill system.

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Fairfield Facts

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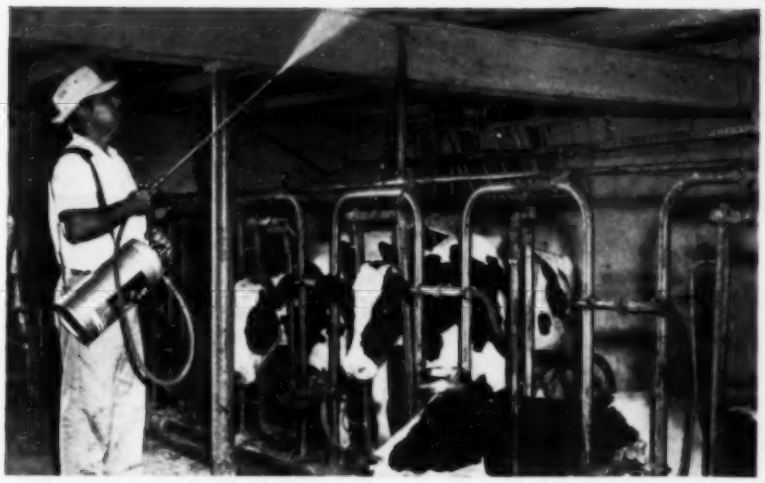
FLY CONTROL MEANS BETTER MILK



ARE THESE COWS PROTECTED? Increased insect resistance in 1960 will make many once-successful insecticide formulations obsolete, emphasize researchers at Fairfield Chemicals, Food Machinery and Chemical Corp. Use of maximum-effectiveness insecticides containing Pyrenone assure animals of complete protection and prevent loss of farm income due to drop in milk quality.

Flies "Take Off" When Up Against Pyrenone and Crag Fly Repellent

Flies are finding it more dangerous lately to attack grazing animals. Not only is it proving more uncomfortable for the flies, but it's becoming downright fatal.

Farm use of insecticide and repellent combinations like Pyrenone* and Crag Fly Repellent† afford additional protection to grazing animals... protection that kills flies on contact and repels future attacks for several days.

Field tests show that sprays which depend primarily on repellents have limited value. Flies, gnats and mosquitoes stay in the area, bothering animals and attacking non-treated stock. When grazing cattle are annoyed by insects, quantity and quality of milk yields suffer.

To the farmer, milk loss means money down the drain, a sharp drop in profits. When cattle are busy battling biting insects they haven't time to graze properly. They take in less food and lose blood, energy and weight.

Versatile Pyrenone and Crag Fly Repellent combinations, available as oil sprays and water emulsions, are the answer. Highly effective, they are accepted under the Miller Bill on a "non-residue" basis. No trace of these approved formulations appears in milk or meat of treated animals. They assure maximum protection for greater milk output the year 'round.

*U.S. Pat. Off. FMC †U.S. Pat. Off. U.C.C.

Copies of the following booklets may be obtained from local Fairfield representatives or by writing to Fairfield Chemicals, Food Machinery and Chemical Corporation, 441 Lexington Avenue, New York 17, New York.

☐ TECHNICAL BULLETIN No. F-1—Free bulletin describing Pyrenone and Crag Fly Repellent formulations.

☐ FAIRFIELD FACTS FINDER—a new, 20-page comprehensive guide and unique, revolving calculator covering Pyrenone base formulations for dairy, garden, home and industrial sprays, aerosols and powders as well as an index to insects and pests. Price—$1.00.

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Branches in principal cities. In Canada: Natural Products Corporation, Montreal and Toronto.

Pyrenone Formulations Keep Cows Contented As Flies Get Tougher

Formulators whose insecticides offer Pyrenone's maximum protection will get a greater share of farm business during 1960. Field tests prove that maximum control of biting flies means better milk—hence, more money for the farmer.

With flies becoming harder to kill every year, dairymen can't risk insecticides that lose their "punch." Entomologists reveal that in some areas last year, they changed formulations two and three times to maintain fly control. Non-toxic Pyrenone appeared in virtually every final successful insecticide.

Milk quality suffers when biting fly control is below maximum. In Illinois, during a May-June span, twelve herds not protected by an effective insecticide lost 13 to 14.8 percent in butterfat. A 1-percent piperonyl butoxide and 0.1 percent pyrethrins Pyrenone emulsion used twice a week in amounts of 10 to 15 ounces per cow brought butterfat back to normal in a month.

Effective Pyrenone formulations for sprays, emulsions, powders, etc., are included in a free booklet, "Dairy, Livestock and Cattle Sprays, and Dusts," available upon request.

☐ DAIRY SPRAYS—Free booklet describing Pyrenone formulations for sprays, emulsifiable concentrates, wettable powders, fogging sprays. Pyrenone and repellents, Pyrenone aerosols, cow bombs.

THERE ARE 6 SOUND WAYS TO SELL IN '60

AND THE Hi-D® PROGRAM'S GOT THEM ALL!

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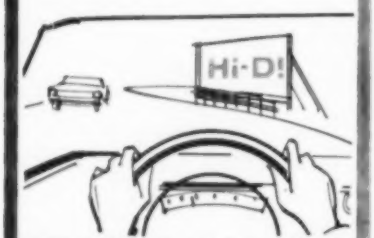
Billboards in 879 locations spread across 13 top-market states in the South and Midwest.



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A 10-state campaign for a solid 13 weeks emanating from 18 TV stations.

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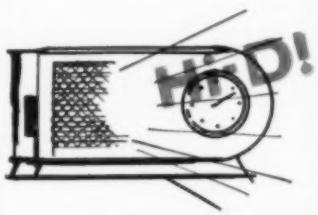
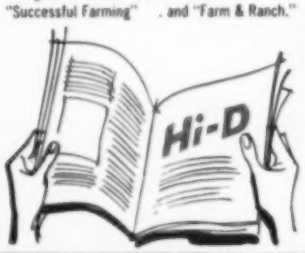


MAGAZINES

Full-page, four-color advertisements appear in "Progressive Farmer" . . . "Farm Journal" . . . "Successful Farming" . . . and "Farm & Ranch."



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Attention-getting point-of-sale material for in-store promotion. Includes Hi-D mobile . . . soil sample bags . . . counter display with Hi-D samples . . . wall banners . . . consumer folders . . . matches . . . and technical data service.

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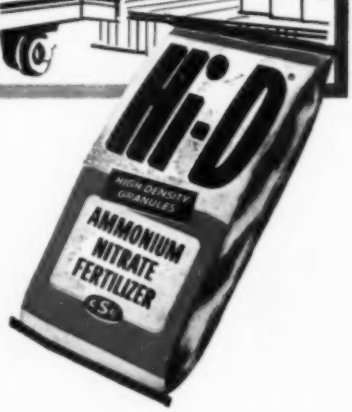
Two brand-new items designed for posting outside your store or warehouse: attractive Hi-D metal sign and large clock-style thermometer identify your store as Hi-D headquarters.



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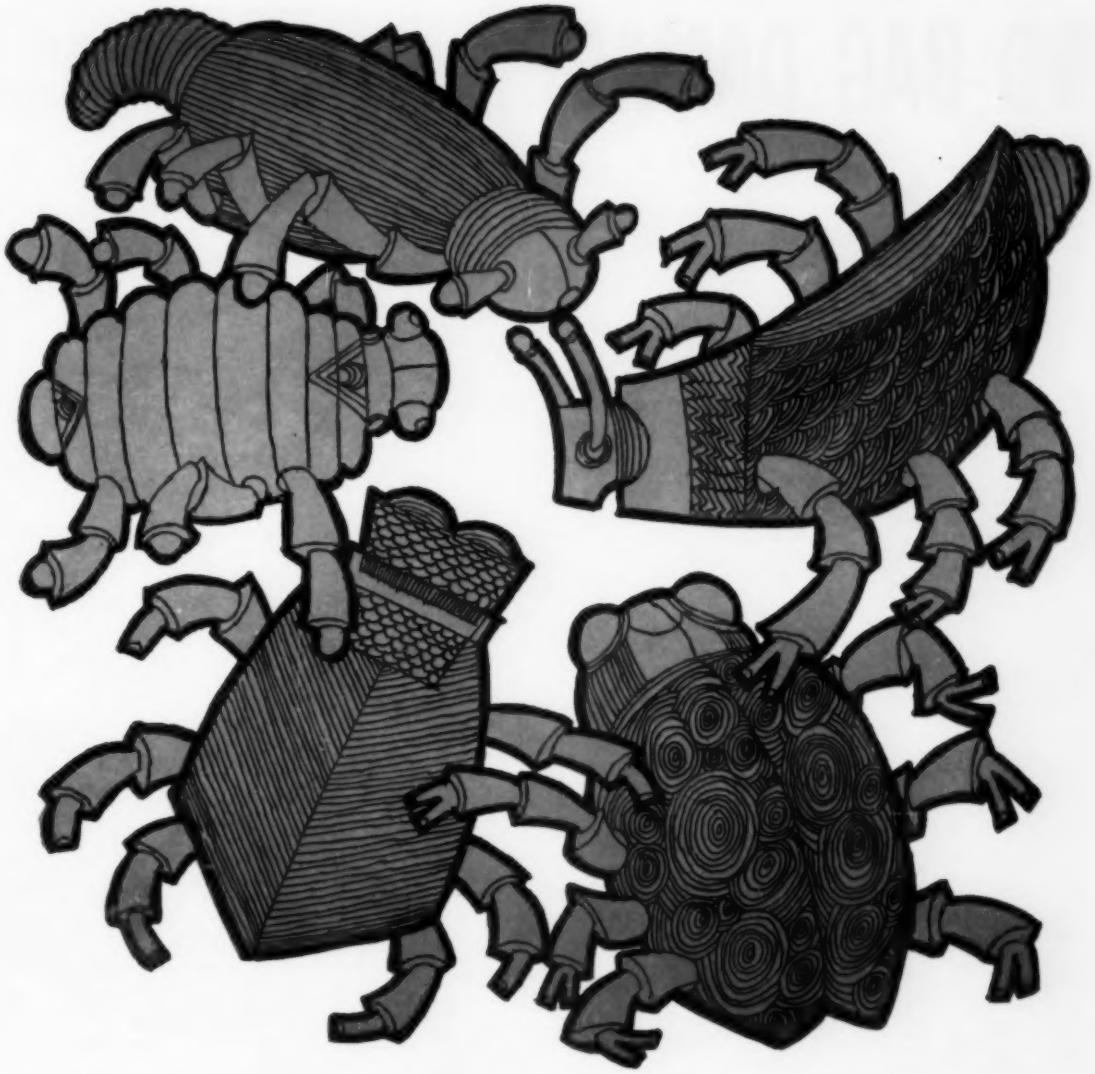

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Engine power has replaced "horse power," making possible bigger farms, better tillage, more economical farming.

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Just as Old Dobbin and the walking plow have given way to modern tractor plowing, so, too, has fertilizer manufacturing been improved. Today, fertilizer manufacturing employs precise, scientific techniques incorporating modern equipment and chemical engineering know-how.

If you have agronomic or fertilizer manufacturing problems, or are looking for new information on improved techniques for more economical production, just call on Texaco for help and suggestions. Our Technical Service people in these fields have a wealth of experience in agronomy and fertilizer manufacturing, both in research and practice.

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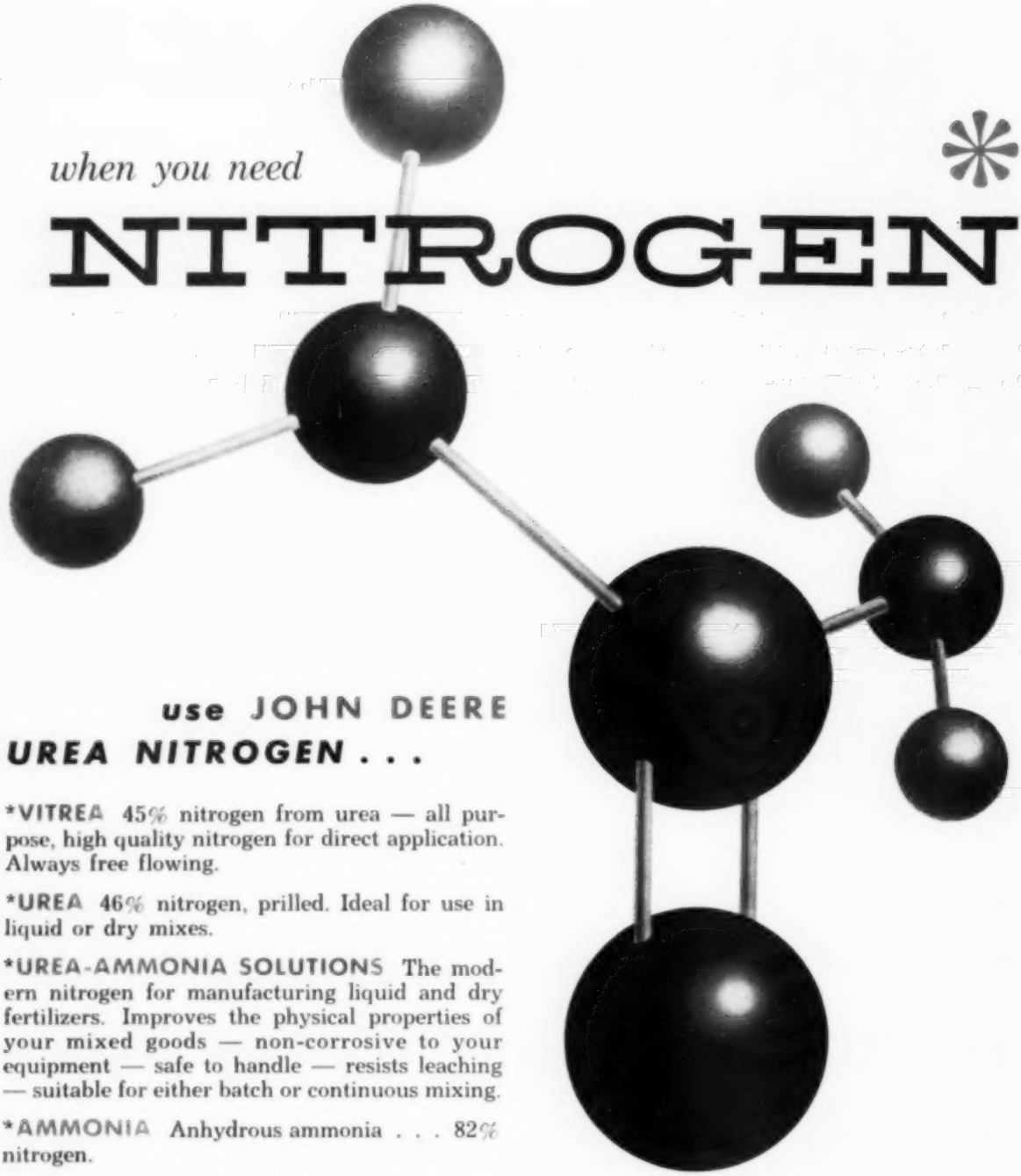

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Whether your Sulfuric Acid requirements are an occasional tank car or large tonnages, check with Tennessee before making your decision. You will find our acid attractively priced, high in quality, consistently available and backed by outstanding customer service gained through years of growth and experience.

Our complete control of raw materials from mine to finished product allows our total independence from elemental sulfur and enables Tennessee Corporation to accommodate and ship large tonnages of acid quickly and with minimum notice.

The sulfur contained in the ore we process yields Virgin Sulfuric Acid of highest quality free from organic matter, very low in iron, and in no way contaminated from regenerated or spent sulfuric acid sources.

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IT ALL COMES DOWN TO THIS CRITICAL POINT

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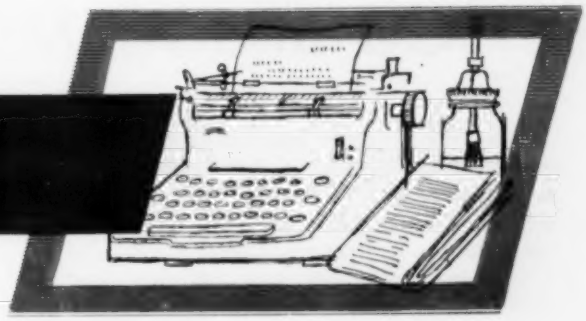
TRIPLE SUPERPHOSPHATE

CYANAMID SERVES THE MAN WHO MAKES A BUSINESS OF AGRICULTURE

EDITORIALS



THE Food Additives Amendment to the Food, Drug and Cosmetic Act is scheduled to go into full effect on March 6. This date is the deadline for users of such additives to have demonstrated that these materials are safe for human consumption. Incidentally, the responsibility is now on those using such additives to demonstrate that they are safe, rather than, as previously, on the government to prove an additive harmful before its use can be banned.

As the deadline approached, full technical data on only a limited number of food additives had been submitted to FDA as required, but there still seemed to be a good prospect that the new regulations would take effect without serious complications for the food handling and processing industries and for producers of commonly used additives. Over recent weeks officials of Food and Drug have indicated that several hundred widely used additives would get tacit approval under the category of being "generally recognized as safe." In addition there is the prospect of a series of one year extensions, allowing many materials to be used beyond the deadline, even though complete proof of their safety has not as yet been submitted. F.D.A., it is reported, will be guided in such cases by evidence disclosed by preliminary laboratory studies, and will probably allow continued use of products that it seems apparent will eventually be demonstrated to be safe.

This complacent view of the situation presupposes, however, that the new rules will be enforced with intelligent discretion, rather than literally, and we fail to see anything in the recent record that would suggest that Food and Drug will exercise such restraint in handling its new responsibilities. As long as laws are enforced by men, there is always more danger from the men than from the laws themselves. And, thinking back to what happened to the cranberry growers, we can well appreciate that growers will not feel safe until the present law is modified. The power to demoralize an agricultural market and to spread panic among consumers is too dangerous a weapon to leave in the hands of an agency which has already demonstrated that it lacks a great deal in scientific objectivity.

A VERY important meeting for the fertilizer industry was held last month down in Eatonton, Georgia. Our southeastern states have for years been the heart of the fertilizer industry—the first big area of the country to make intelligent use of plant food. Over the past ten years, however, the southeast has fallen behind the rest of the country, not only in rate of gain in fertilizer use, but also in its willingness to follow new fertilizer technology.

Some very significant facts were presented. What they add up to is that use of the fertilizer in the midwest has increased over six hundred percent in the last 20 years, and other geographical areas have recorded similar major increases in consumption, while the southeast, which was the first part of the country to use fertilizer in a major way, has fallen behind the parade. Not only has the gain in use been at a much lower rate, but the new forms of fertilizer that have proved so popular, efficient and economical elsewhere, have made but little progress in the south. We refer, of course, to granulated fertilizer, liquid fertilizer, anhydrous ammonia, etc.

One speaker suggested that perhaps the southern farmer feels that he has been using fertilizer

(*Continued on Page* 123)

YOU and AMMONIUM SULFATE

Synthetic nitrogen production has steadily increased in the U.S. over the past 20 years, with rated capacity in 1959 reaching some 4½ million tons. The dominance of synthetic ammonia as a primary nitrogen material in American agriculture may be expected to continue.

Sulfate of ammonia, however, has certain intrinsic advantages over competitive products, that warrant the expectation that it should continue to find favor in fertilizer formulations. Producers should constructively exploit these advantages.

Part I

by Dr. Vincent Sauchelli

Chemical Technologist
National Plant Food Institute
Washington, D. C.

THE world nitrogen industry now represents a capital investment of some $2,850,000,000, with an annual productive capacity of about 11,000,000 tons of pure nitrogen (value, about 1 billion dollars). Actual production in 1958-59 was 10.4 million tons N. About 83% of this world production is agricultural grade, the remaining 17% goes into industry use. Of this total production, the United Sttaes last year accounted for about 30%; western European countries, about 50%.

The most rapid development in the use of nitrogen since 1940 has occurred in the United States. During these two decades consumption increased five-fold while production increased nearly seven-fold. (See Table I)

Aikman Ltd. estimates an excess of production over consumption in 1957-59 of about 600,000 metric tons nitrogen. American producers are operating at about 75% of capacity, while large European producers have cut back to about 80% of capacity owi ig to low prices.

Of the world nitrogen productive capacity, synthetic ammonia represents about 81% of the total; by-product facilities, about 7.5%; calcium cyanamide, about 7.5%; and Chilean nitrate, about 4%. Western Europe is the principal nitrogen exporting area, and accounts for about 65% of the world exports in nitrogen.

The spectacular growth of the synthetic nitrogen industry in the United States, from about ½ million tons in 1940 to about 11½ million tons capacity in 1959 has necessarily had a tremendous impact on the nitrogen materials market. During the past 10 years the annual growth of this industry has been at the rate of 11 per cent. It's no wonder that sales managers of coke-oven by-product works may perhaps be somewhat bewildered at the effect of all these developments on the sulfate of ammonia market. You in the coke-oven industry may think you have problems! Do you know about the headaches and bewilderment afflicting the synthetic ammonia industry? And the worries and perplexities of the mixed fertilizer industry? The cause is the same, namely, overcapacity. We're all in the same boat.

In 1940 the U. S. had 8 synthetic plants, capable of producing some 400,000 tons of nitrogen, while operating at about 70% of capacity. Total consumption was about 600,000 tons of which agriculture consumed about 65 per cent. By 1959, the number of such plants had increased to 60, with an annual rated capacity of some 4.5 million tons of nitrogen. The plants were operating at an average of only 75% of capacity. Fixed costs dictate to management that a 25% reduction in annual output can, if persistent, be ruinous.

Total consumption had increased by 1959 to some 3¼ million tons, of which 68% was taken by agriculture. How this tremendous synthetic nitrogen productive capacity grew so swiftly, aided and abetted by federal government agencies has been told effectively by George V. Taylor[1] of the Southern Nitrogen Company. The exigencies of war justified perhaps the federal government's building of 9 nitrogen plants with an annual capacity of about 900,000 tons nitrogen. When the war ended, these became surplus plants. They were disposed of at very low prices, with fast write-off privileges.

Despite the alarmist views of impending recession at the end of the war, the demand for nitrogen, particularly from the Middle West farmers, continued unabated. Low priced nitrogen was a great stimulus to farm production. Up till the 1940's this nutrient had always been high priced and its use in adequate amounts for high acre yields had been enjoyed by only a few farmers. Economists in the Corn Belt had for years preached that it did not pay to put nitrogen on corn. At the relatively high per unit cost of nitrogen prevalent before the 1940's, and with open-pollinated corn, that was true. But hybrid corn, introduced to the Corn Belt on a commercial scale in the late 30's, required nitrogen in relatively higher amounts if it was to produce at its potentially high capacity. Corn Belt farmers then literally "went to town," applying generous amounts of mixed fertil-

* Based on an address by Dr. Sauchelli, presented at the western regional meeting of the American Coke and Coal Chemicals Institute, Drake Hotel, Chicago, Illinois, February 4, 1960.

(1) Chemical Market Research Assoc. meeting, New York, May 19-21, 1959.

izers and particularly plenty of nitrogen. It is now generally recognized that it requires about 150 to 200 pounds of nitrogen (equivalent to 750 to 1000 lbs. sulfate of ammonia) to produce a 100-bushel crop of corn; for every additional bushel it takes an additional 1½ pounds of nitrogen. Nitrogen comes first in the fertilization of commercial corn. Dr. Roger Bray, soil specialist at the Illinois Agricultural Experiment Station, estimates that Illinois farmers lost about 350,000,000 bushels of corn last season, because Illinois corn soils were short about 415,000 tons of nitrogen, all other factors being favorable.

The synthetic ammonia industry was, at its start, closely oriented to locations able to supply low-cost hydrogen, one of the industry's essential raw materials. Natural gas sources in the Southwest attracted the early investments. Later, as natural gas pipe lines were scattered all over the country, new plant facilities were enabled to establish close to potentially large consuming areas. Savings in freight cost alone, to consuming points in territory adjacent to a plant, warranted the expectation of a profitable outlet. These developments sharpened competition within the nitrogen industry.

Table I. Estimated World Production and Consumption of Nitrogen 1957-58 and 1958-59

	1,000 Metric Tons			
	1957-58		1958-59	
Country	Production	Consumption	Production	Consumption
Europe & Egypt	4,691	3,977	5,181	4,169
United States	2,950	2,950	3,100	3,100
Canada	575	405	655	431
Asia	1,281	1,719	1,420	1,813
Others	94	315	96	344
Total	9,591	9,366	10,452	9,857

Source: Aikman Ltd.

Coke-oven ammonia facilities are not located independently and solely with reference to agricultural markets; they are captive to steel plants. This fixed position ordinarily would pose a problem. However, the majority of coke-oven by-product facilities happen to be clustered in areas of high fertilizer consumption. Seven plants each in Alabama and Illinois, twelve in Ohio, thirteen in Pennsylvania, five in West Virginia and three in Indiana; other plants scattered.

Before 1945 more than 90 per cent of the annual domestic production of ammonium sulfate was made with coke-oven by-product ammonia. Subsequently the proportion of by product ammonium sulfate declined substantially, and by 1957, the proportion was down to about 47 per cent or 946,000 tons.

Table 2 gives us a summary of the trends in the production of sulfate of ammonia since 1943 at both synthetic and coke-oven plants. Coke-oven production of sulfate of ammonia has remained fairly constant, whereas synthetic ammonia production has steadily increased from 83,000 tons to over a million tons, within the period 1943-1958.

Table II—Production of Anhydrous NH_3, Ammonia Liquor, Ammonium Sulfate, Ammonium Nitrate, Urea and Diammonium Phosphate, Year Ended June 30, 1944-1958 (1000 short tons)

Calendar Year	Synthetic NH_3	Coke Oven NH_3 Liquor (a)	Ammonia Sulfate		NH_4NO_3	$(NH_4)NO_2HPO_4$	Urea
			Synthetic	Coke Oven			
1944	—	31.6	83	818	435	—	—
1945	548.7	27.6	89	764	421	—	—
1946	725.5	25.0	157	644	725	—	—
1947	1,114.0	25.7	196	809	1,087	—	—
1948	1,090.0	24.8	264	831	988	—	—
1949	1,294.0	22.8	846	757	1,019	—	—
1950	1,566.0	23.4	1,138	831	1,214	—	—
1951	1,777.0	24.9	622	898	1,346	—	—
1952	2,052.0	22.1	813	802	1,467	—	—
1953	2,288.0	24.8	576	946	1,558	—	—
1954	2,736.0	16.1	928	823	1,858	—	—
1955	3,252.0	16.6	1,131	970*	2,099	—	—
1956	3,378.0	17.7	1,087	883	2,204	23.5	422.4
1957	3,733.0	17.3	1,040	946	2,586	38.0	480.2
1958	3,879.0	15.0	1,094	681	2,581	41.0	530.6

(3) NH_3 content.
*Includes some $(NH_4)_2HPO_4$ (Diammonium phosphate).
Source: Bureau of Census, Dept. of Commerce, Minerals Yearbook 1958.

Table 2 also summarizes developments since 1944 in the production of the important carriers of nitrogen used in agriculture. Two recent additions are shown, urea and diammonium phosphate. In my judgment, these late comers are more than likely to assume increasing importance in the future: they deserve serious consideration competitively.

Synthetic Ammonia Competition

It seems to me the dominance of synthetic ammonia as the primary nitrogen material in American agriculture will continue in the future. Ammonia, ammonium nitrate, nitrogen solutions, and urea are destined to gain more tonnage and remain the principal nitrogen materials. Perhaps some less soluble forms may be developed to satisfy the demand for such types. The trend to higher analysis materials and the popularity of the synthetic nitrogen materials will continue in all consuming areas. This trend involves consumption of fertilizer grades having higher percentages of nitrogen.

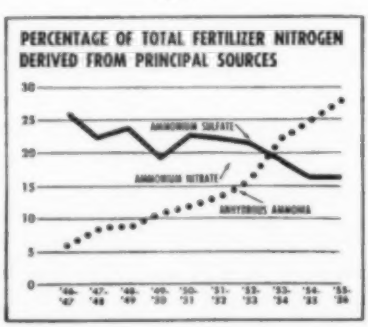
How does this trend affect coke-oven sulfate of ammonia production? It does, in a very direct manner.

In 1948 about 90 per cent of coke-oven sulfate of ammonia was produced in three regions, namely, the Mid Atlantic (48%), the East North Central (30%) and the East South Central (12%). In that same year the East South Central Region consumed more sulfate of ammonia than was produced in it by the regional coke oven facilities—(144,168 tons consumed; 96,756 tons produced). This large market apparently was attractive to synthetic ammonia producers and 3 plants built in the adjoining West South Central Region were for the purpose of sharing in that market: Phillips Chemical Co. at Houston, capacity 266,000 tons; Lion Oil Co., El Dorado, Arkansas, 138,700 tons; and Mathieson Chemical Co. at Pasadena, Texas, capacity not known. These companies promoted their product aggressively, using a corps of technically trained service representatives and considerable advertising in all media. Synthetic sulfate of ammonia is being produced chiefly in Texas and California.

Sulfate of ammonia has certain intrinsic advantages over competition, however, that warrant the expectation it should continue to find favor in fertilizer formulations and for direct application to soils. These advantages the producers should exploit constructively in the market place.

The revolution in fertilizer manufacturing practices represented by granulation and ammoniation has caused sulfate of ammonia to fall from its long dominant position in mixed fertilizers. The rising demand for higher analysis goods favors the nitrogen materials of high concentration. In the past 25 years there has been a steady increase in total plant food content of mixed fertilizers, from 18.34 to 30.22 per cent. Another and serious factor is the relative cost per unit of nitrogen. Since sulfate of ammonia contains only 20.56 to 21 per cent nitrogen, the relative cost per unit of nitrogen, even at the current low ton cost, is somewhat higher than the per unit cost of nitrogen in ammoniating solutions or in anhydrous ammonia. The fertilizer dry mixer, also facing severe competition, will naturally use only that quantity of purchased sulfate that he believes absolutely necessary. He would like to use more of it, if economical, since it is convenient to handle, gives his mixture free-flowing, noncaking, and good storage qualities.

Figure 1



These advantages still hold, but economics govern the choice. Total sulfate of ammonia usage in mixed fertilizers dropped almost 10 per cent in the decade beginning with 1946-47. This is shown in Figure 1.

K. D. Jacob of the U. S. Department of Agriculture points out that, since about 1925, the proportion of the annual consumption of total primary nutrients, in mixed fertilizers, had ranged from 60 to 75 per cent. After 1948, the trend started to decline. Mixed fertilizers have consistently supplied agriculture the smallest proportion of the nitrogen consumed. The substantial decline in the proportion of nitrogen in mixed fertilizers—from 57.6 per cent in 1947-48 to 37.4 per cent in 1957-58—reflects chiefly the expanding use of ammonium nitrate and anhydrous ammonia for direct application to soils.

Domestic use of ammonium sulfate, as fertilizer in 1954 totaled 1,400,000 tons, of which about 67 per cent was utilized by the mixed fertilizer industry; ten years prior, in 1944, the proportion was 83 per cent of the total.

(To be Concluded)

In the final installment of this report on ammonium sulfate, Dr. Sauchelli reports on "Exploiting advantages to create sales," listing specific features in the product which have not been called aggressively to the attention of the fertilizer industry. For example the high sulfur content, and improved properties in granulating fertilizers.

Dr. Sauchelli states that ammonium sulfate should be able to maintain its present tonnage, and perhaps gain some during the next decade. To do this, however, it will have to secure some of the direct application tonnage and bulk-blend market.

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The 24th annual Pest Control Operators Conference was held Feb. 1 to 5 at Purdue University, Lafayette, Ind. More than 400 people attended.

Alabama Pest Control Conference stresses correct application and timing for successful and approved use of pesticides upon food crops

THE growing importance of proper mixing and application of pesticides and the necessity for extra care in using chemicals were emphasized at the 1960 Alabama Pest Control Conference, held February 17 and 18 at Auburn University, Auburn, Ala. With proper and timely use of pesticides so essential under today's conditions, the point was stressed that careful use is necessary to prevent banning of useful chemicals.

Foy Helms, Auburn Extension economist, said Alabama farmers face discouraging prospects for the 1960 crop year. With the prospect that prices for Alabama farm products will drift 2 to 3 per cent lower than last year, the only way for farmers to overcome the cost-price squeeze, he stated, is to produce a higher volume at a lower per unit cost.

He said farmers are now receiving only about 79 per cent of parity for cotton, 55 per cent for corn, 62 per cent for sweet potatoes, 69 per cent for soybeans, and 81 per cent for peanuts. Beef cattle are down to 84 per cent of parity and hogs have dropped from 78 to 52 per cent in a year. In closing, Mr. Helms called for educational institutions and farm related industries to join together to help individual farmers develop farm plans that include every sound production practice.

Getting the right mixture of pesticides for spraying crops, and calibrating sprayers to apply the correct amount, are big problems for many farmers who are shifting to use of low-volume sprayers. Poor results or extra expense from using too much of the pesticide will result if dilution and calibration are not done correctly, warned Dr. G. H. Blake, Jr., associate entomologist, in a talk reviewing how to calculate pesticide dilutions.

Dusts, he observed, are generally formulated at concentrations that are used in field applications, at dilutions of about 1 to 20 per cent. In this form pesticides are fairly stable and can be handled easily by farmers. Liquid forms of pesticides, however, cannot be marketed as dilute sprays because such preparations are generally unstable in water and are too bulky in the concentrations used. Thus they normally reach the user as spray concentrates, either wettable powders, soluble powders, emulsifiable concentrates, or miscible concentrates.

Wettable powders are less toxic to animals than emulsions or solutions, but have certain disadvantages, Dr. Blake pointed out. The larger particle size prevents use of small nozzles because of clogging and nozzle erosion, and considerable agitation is required in the spray tank. In addition, gear type or roller pumps are ruined by abrasive action of the powders. Because of these disadvantages, he stated, emulsions or solutions may be preferred over the suspensions, even though the oils used in emulsifiable concentrates and smaller particle size allow for much quicker entry into the body of the insect pest.

Figuring dilution is different with wettable or soluble powders than it is with spray concentrates, Dr. Blake explained. Powders contain a certain percentage of pesticide per pound of preparation. To arrive at a given concentration of dilution in percentage, the pounds of diluent (generally water) must be determined. Then the weight of the gallons that must be mixed is determined and this multiplied by the percentage of the desired spray to learn how many pounds of technical pesticide are needed. This figure is divided by the percentage of the pesticide in the formulation being employed, and this amount added to the correct volume of water.

For diluting liquid concentrates, Dr. Blake explained, it is simply a matter of proportion. He gave an example of preparing a

Discussing latest methods in controlling farm and household pests are (l.to r.): Dr. G. J. Haeussler, USDA, Beltsville, Md.; W. G. Eden, Auburn Experiment Station; George Williamson, Agricultural Chemical Service Co., Montgomery; and W. T. DuBusk, Penn. Salt Co.

Shown discussing control of farm and ornamental crops pests are (l. to r.): E. V. Smith, dean, Auburn School of Agriculture; Joseph Freeman, nurseryman of West Point, Ga.; Lynwood Jenkins, West Point nurseryman; and V. S. Searcy, agronomist of the Experiment Station.

one per cent spray using a 25 per cent emulsifiable concentrate. 24 parts of water are, of course, needed for one part of the concentrate.

T. E. Corley, associate agricultural engineer, said the low-volume sprayer is the most important development in application equipment in recent years. This sprayer can be used for all pest control and defoliation work, and is fast becoming a standard piece of equipment on farms. But, he added, too few farmers are familiar with proper use of the sprayer. A more thorough understanding of the versatility and correct use of the low-volume sprayer, he believes, will increase farmer acceptance, and will mean wider use of pest control and defoliation recommendations.

Mr. Corley emphasized the importance of applying precise quantities of pesticides for best results. Too much spray can, of course, cause injury and is a costly waste, and too little will not do the job.

Such determinations, he suggested, can be made by collecting and measuring deposits while spraying at measured distances. Charts are available that can be used to avoid complicated calculations. If the desired amount is not being applied, changes must be made and the sprayer recalibrated. Changing pressure is the best way to make small changes in amount of spray, Corley stated.

Once the sprayer has been calibrated, the following precautions must be taken to ensure that the correct amount of pesticide is applied: (1) mix the material in clean water and in correct proportions; (2) apply at same pressure and tractor speed as when calibrating; (3) keep nozzle screens and openings clean; and (4) keep solution thoroughly agitated while applying.

Dr. F. S. Arant, zoology-entomology department head, declared that cotton insects continue to increase in importance as a factor affecting production. Biology of the boll weevil has apparently changed in recent years, he reported, and it is now better adapted to living in northern Alabama. There is evidence that it lives longer and lays more eggs than before. In addition, resistant populations have developed in some sections of the state. Also improved cropping practices, including irrigation and use of high rates of fertilization, have resulted in cotton growing larger and ranker. This offers ideal conditions for insect development. Widespread, and in some instances excessive, use of insecticides has resulted in increased damage from aphids, spider, mites, and in some cases bollworms.

Particularly in view of this changing biology of the boll weevil, Dr. Arant stated, it is more important than ever to know what insecticides to apply, and when to apply and when not to apply it. He advised examining cotton weekly until bolls are grown and applying insecticides only when there is need for control.

For growers who got control of boll weevil with chlorinated hydrocarbon insecticides in 1959, Dr. Arant suggested using the same material in 1960. If resistance is suspected, he recommended doubling the rate for two applications. If this fails to give control, he said, use methyl parathion-DDT, malathion-DDT, Guthion-DDT, Sevin, toxaphene-DDT, or Strobane-DDT for the remainder of the season.

V. S. Searcy, assistant agronomist, predicted a large increase in use of herbicides in 1960. CIPC and diuron (Karmex DL) are recommended pre-emergence herbicides for cotton. Searcy said CIPC is used at the rate of 1 to 1.5 pounds per acre on sandy soil and 2 to 2.5 pounds on heavy soil. Diuron is recommended at the rate of ¼ pound per acre on sandy soil and ½ pound on heavy soil. These amounts are applied to a 12-inch band in 40-inch rows. He stressed the importance of planting cotton level or on slight beds so the herbicide will not be concentrated in and around the seed should rains occur shortly after planting.

Herbicidal oil is the only material recommended for post-emergence weed control in cotton, Searcy stated. Last year was the first time it was available in Alabama. It is used at the rate of 5 gallons per acre per application applied in a 10-inch band. Oil can be applied as a directional spray when cotton is 2½ inches high, but not closer than 5-day intervals and a maximum of 3 applications. It will kill cotton if applied to the leaves and will kill or damage cotton if applied when there are cracks in bark at base of the plants.

Searcy cited results of tests with "lay-by" herbicides in cotton. He said that diuron at 1 to 1.5 pounds per acre broadcast and CIPC at 6 pounds did a good job of controlling most weeds in the 1959 tests. EPTAM gave good weed control, but injured cotton.

Jack Dreessen, herbicide specialist of the National Agricultural Chemicals Association, stressed the need for good public relations in the pesticide industry. He said a growing portion of the public is becoming unduly fearful of the use of pest control chemicals, but voiced the belief that a majority will accept pesticides as an important contribution to present day living if the true facts are presented.

Officers of AACEP, president, U. L. Diener, Auburn, Ala.; vice-president, R. J. Smith, American Cyanamid, Montgomery; director, G. A. Orum, State Department of Agriculture, Montgomery; and retiring president, Dr. W. G. Eden, Auburn, Ala.

Formulation of Pesticides

A complete formulating plant for agricultural pesticides will handle both solids and liquid formulations. S. H. McAllister, of Shell Chemical Corp., describes typical installations in addressing the American Institute of Chemcal Engineers last month, as part of a Pesticide Symposium. The following comments are from Mr. McAllister's report.

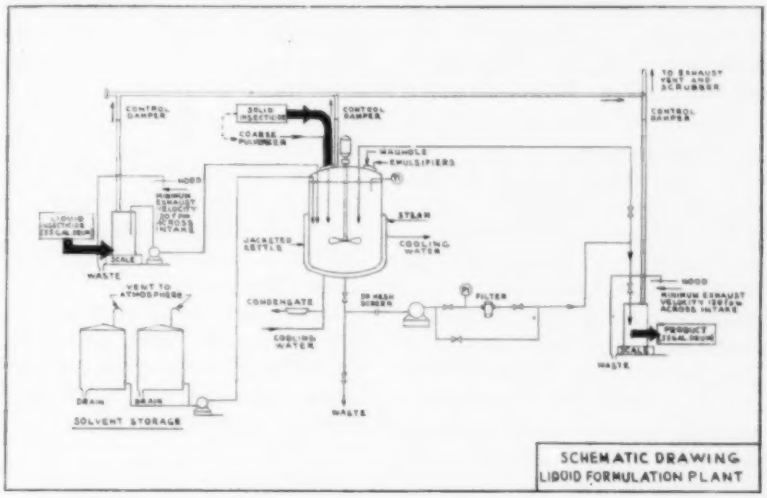
WHILE nearly all pesticides must be formulated, this is not necessarily done by the manufacturer of the technical material. In fact, the industry may be roughly divided into three general groups as shown in Table 1.

These company designations are not rigid nor static. The industry is a dynamic one and major policy shifts can and do occur with the introduction of new products. This may be stimulating from the competitive standpoint but it is confusing and is not conducive to a stable dividend rate.

Involved in these operations are approximately the following number of chemical compounds classified as to pesticide end use: (See Table 2).

One reason for the confusion is that a relatively large amount of capital is not required to enter the formulating end of the business on a local or regional basis. Many are attracted to enter the field by the "mirage" of high mark-ups and profits, relying on the basic manufacturer to furnish a competitive toxicant and the technical "know-how" as well.

Those who are soundly financed manage to survive, but others in desperation resort to price cutting and other short term expedients which only postpone their inevitable day of reckoning. Contrary to what many who are not familiar with the problems of the industry think, mark-ups in general are not high considering the risks involved, and the long term problem of dealing with a fluctuating market. Nowhere is this more clearly evident than where government competitive bidding is involved; for example, in the wettable powders used for World Health malarial applications. See Table 3 on page 36.



SCHEMATIC DRAWING
LIQUID FORMULATION PLANT

Table 1

Producers & Sellers of Basic Toxicants	Integrated Producers	Independent Formulators
Shell Chemical	Stauffer Chemical	Thompson Hayward
Velsicol	General Chemical	Coahoma
Hercules Powder Co.	Diamond Alkali	Agricultural Chemicals
*American Cyanamid	Olin Mathieson	United Heckathorn
*U. S. Rubber	Penn Salt Mfg. Co.	Riverside
Frontier Chemical	Niagara	Valley Chemical
*Rohm & Haas	Cal-Spray	Chapman Chemical
Victor Chemical	Chipman Chemical	Woodbury Chemical
Montrose	Monsanto	Fasco
	Dow Chemical Co.	P. B. I.
	Geigy	Planters
	DuPont	Hayes Sammons
	Chemagro	Cotton States Chem. Co.
	American Chem. Paint	Miller Chemical Co.
	American Potash	Imperial Chem. Co.
	Pittsburgh Plate Glass	Port Fertilizer Co.
		Unico
		(Plus 60-70 smaller formulators)

*Partially Integated

Types of Formulation

WHILE almost an infinite variety of formulations are possible, those of interest fall mainly into the following categories: (1) dusts – about a half billion pounds of diluents are used for

Table 2

Number of Commercial Compounds Used As Pesticides

Fungicides	67
Herbicides	84
Insecticides	66
Soil Fumigants	8
Rodenticides	11
Total	236*

*These 236 basic toxicants reach the consumer in one or more of about 7,000 branded formulations.

these formulations; (2) wettable powders; (3) granules; (4) emulsifiable concentrates—some 30 million gallons of solvents are used; (5) aerosols.

Let us now examine some of the chemical and physical problems which are encountered in preparing suitable formulations, bearing well in mind that the formulation must not only be fitted to the chemical involved but also to the end use.

Dust Formulation

A typical dust formulation as used in the field contains about 98% so-called "inert ingredients" over which the toxicant must be uniformly distributed. Often the dusts are made up as 20-50% concentrates for ease of storage and transport and then "let down" locally as needed. The dust concentrates are made by milling the toxicant with the carrier or in the case of a liquid toxicant by impregnation with a solution.

For carriers, high absorptivity and good flow characteristics are essential, and thus makes the adjective inert rather deceptive. Herein lies one of the formulator's major problems. It has been estimated that a pound of the average kaolin or pyrophyllite ground to below 200 mesh represents a surface area in excess of 15,000 sq. feet, and over this area there are a number of active chemical sites. If these are not neutralized, or otherwise rendered inert, they can markedly affect the stability of the formulated product. Ordinarily we consider chlorinated insecticides as rather stable, but in this highly attentuated form decomposition is accelerated. In fact, before this was fully appreciated, decomposition in some instances was so rapid as to initiate fires.

Today, many dust formulations contain some form of stabilizer. The situation, with the present phosphate insecticides, is even more serious and while thermal effects are not pronounced, hydrolysis can occur with loss of biological activity. Considerable research activity is now in progress on this problem, but at present emulsions rather than dusts are favored for the phosphate group.

The problems encountered with dust formulations are also found in an even more aggravated form with the wettable powder. These are used widely in World Health programs, where they are diluted in the field with water of various degrees of hardness. They are made up as 50-75% active concentrates, and they must have excellent flow characteristics even after prolonged tropical storage. For this use, very highly absorptive clays or synthetic silicas are used and the surface areas of such materials are phenomenal.

To assure insecticide stability, carriers must be chosen which are not catalytically active; or, if active carriers are used, the active sites must be deactivated.

Solid Formulation

A type of solid formulation which has gained considerable popularity in recent years is the granular formulation. This consists of the pesticide sorbed on a sized granular carrier such as clay vermiculite, or some type of botanical material. The granules are formulated by liquid impregnation. If the pesticide itself is a liquid, it can be sprayed directly onto the granular carrier. If it is a solid, it is melted or applied as a solution to insure complete coverage. Care must be taken to exceed the sorptive capacity of the carrier. The granules are prepared in blenders, similar to cement mixers.

Emulsifiable Concentrate

The emulsifiable concentrate is by far the most popular. The research problems involved are mainly those of colloid chemistry and vary widely depending on the toxicant and application.

First of all, it is necessary to determine the solubility of the pesticide in a number of commonly-used solvents. The temperature at which these soubility tests are conducted is the lowest temperature at which the formulation will be stored, and may be 32°F for Southern formulators or as low as −10°F for those in the Northern States. Inexpensive, relatively nonphytotoxic solvent such as mineral spirits or kerosene are preferred. However, where more powerful solvents are required, xylene or aromatic petroleum fractions are chosen, with great care being taken to see that they are not too phytotoxic.

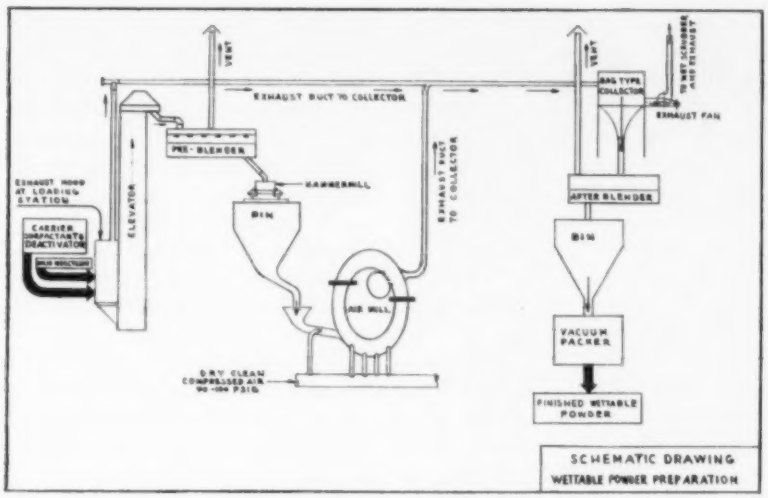
The next step is to select surface active agents which will provide the desired degree of emulsification. Emulsion requirements will vary widely, according to the different types of pesticide. An insecticide emulsion is most effective if it has good wetting and penetrating action, whereas, a fungicide requires a quick-breaking, high-depositing emulsion. Herbicides, on the other hand, are sometimes formulated to give "inverted" emulsions; that is, the water is emulsified in the herbicide solution, rather than the reverse. The formula must be tailored to perform in the various types of water likely to be encountered in the field, taking into account both hardness and temperature. Once the composition of the formulation has been decided, it is necessary to test the shelf life.

It is not within our scope here to explore the formulator's art.

Table 3

Approximate Profit Margin on Wettable Powder Formulations For World Health Malarial Programs

	75% DDT W.P. ¢/lb.	75% Dieldrin W.P. ¢/lb.
Average price of recent bid awards, f.a.s. vessel, U. S. port	25.4	120
Approximate costs of toxicant and formulation	25.0	118
Approximate profit margin	0.4	2



The above are only examples of the many problems and variants involved. From the economic standpoint, it should be readily apparent that major research expenditures are involved to develop suitable formulations for new pesticides and in addition, the manufacturer of the basic toxicant is required to do much of the service work needed to keep his customers economically competitive. Such service work can, for a major manufacturer of toxicants, amount to well over ½ million a year, and is part of the hidden ingredient in every package. It also must be included in the cost of the pesticide if one is to remain in business.

Manufacture of Formulations

THE manufacture of pesticide formulations involves a number of processes, the most important of which are the dry mixing and grinding of solids, the dissolving of solids in liquids, liquid impregnation, blending and packaging. A considerable amount of very practical engineering is involved in each of these steps.

DRY MIXING, or blending, is the process most often used in formulating. Uniformity of product is always important, but it is particularly critical in dilute dusts which contain only a few per cent of toxicant. Ribbon blenders of various designs are used for this application, as they give the best mixtures of the bulky powders in the shortest time.

GRINDING is an essential operation in the formulation of most pesticides. Many pesticides are solids, and these must be reduced to sub-sieve size when making them into dust concentrates or wettable powders. The toxicant is premixed with the carrier, and fed into the mill, which is usually a hammer mill, if relatively coarse dust is required. A good formulator watches his throughput rates carefully; slow rates are, of course, inefficient, but a rate that is too fast will cause overheating in the mill and result in considerable down-time for clean-out. In the preparation of high-suspendibility wettable powders for public health use, an extremely fine particle size is required. Such products are ground in a fluid energy mill, or air mill. Here the material is fed into a circular or oval chamber, where jets of high-pressure air cause it to circulate violently, and to break down to a very fine size because of the repeated particle collisions. This is one of the most effective milling methods known. Unfortunately, it is also an expensive method, because of the high energy requirements supplied in the form of compressed air. Because of the high operating costs, efficiency of operation and maximum throughput rates are essential.

LIQUID IMPREGNATION is of particular interest. The liquid is sprayed onto a bed of carrier, which is kept tumbling in order to present a continuously fresh surface to the spray. The formulator is faced with the problem of attempting to get some of the spray on each particle, and this may be impossible if the carrier is highly absorptive and the quantity of liquid is too small. However, if the formula has been worked out correctly, the quantity of liquid will be adequate, and the formulator can get good coverage by spraying the liquid through nozzles having low delivery rates, while turning over the bed of carrier at a rapid rate. Ribbon blenders can be used for this process, if the product is a dust or a dust concentrate. However, a tumbler blender is preferred for impregnating granular carriers, as ribbon blenders tend to break down the granules and cause an excessive amount of fines.

GOOD PLANT DESIGN is essential to the efficient and safe operation of a formulation plant. In the preparation of certain products, such as wettable powders, it may be necessary to process the material several times, passing it in sequence through a pre-blender, hammer mill, air mill, cyclone separator, after-blender, and packer. A plant should be designed so that the product passes from one stage to the next in a closed system, requiring no handling by hand. The process can be made very largely automatic, from the weighing out of the ingredients to the closing of the filled containers. Automatic timers are employed to control the blending processes, and the rate of feed to the hammer mill for example is controlled by an overload device on the mill. Some formulators favor a "vertical" flow through their plants, with the ingredients starting on the top floor and feeding by gravity to each machine in sequence. A "horizontal" flow is frequently used, in which the various pieces of equipment are all on one floor, and bucket elevators and screw conveyors are utilized to keep the product moving. Most plants feature a combination of the two.

In discussing the various formulating processes and equipment,

the term "throughput rates" has been used a number of times. Usually we strive for the most efficient rate, but at times we simply try for maximum rates. This is a result of the highly seasonal nature of the agricultural pesticide business. The formulation plants tend to operate at maximum output rates during the height of the growing season, and the situation becomes acute if infestations are unusually heavy. Consequently, formulation plants are usually considerably over-designed (and invariably overworked) so that they can put out a year's production in the space of a few months.

Table 4

Formulating Plant Investment Cost

Basis:

A. Entirely new, contractor-engineered and built.

B. Capacity

100,000 lbs/day dusts
40,000 lbs/day granules and wettable powders
50,000 lbs/day liquid products
Total, about 200,000 lbs/day gross products

Items	
Liquid Formulation Unit	$ 230,000
Solid Formulation Unit	430,000
Operating Building including Elevators and Ventilation and Laboratory	200,000
Warehouse Space, total 45,000 sq. ft.	300,000
Office, garage and shop	67,000
General Items	183,000
Utilities including steam boiler Railroad siding Portable equipment and lift trucks Packaging equipment and scales General dust collection system	
Plot Development	50,000
Fencing, yard lighting, roads, Parking area, utility feeder lines, sewers, grading	
Total	$1,460,000

Land not included—about 5 acres.

The preceding cost can be reduced if, as is often done:

1. Formulator leases buildings, uses salvage equipment, avoids formal engineering approach, and does part of erection with own forces.
2. Can use smaller equipment by more than one-shift operation if qualified labor on part-time basis available.

A complete formulating plant for agricultural pesticides will be equipped to handle both solids and liquid formulations. Typical flow sheets for such operations are attached as Figures 1, 2 and 3. The cost of such plants varies widely depending on whether they serve a narrow end use or a wide diversified agriculture. The attached rought cost estimate. (Table 4) is intended merely to show the order of magniture of the cost of an all new medium-sized, diversified formulation plant.

Obviously, if someone else does the basic research, toxicity, label requirements and formulation studies, it is relatively easy to get into this end of the business. The problem is to stay in.★★

PESTICIDE SYMPOSIUM

(*From Page* 8)

marily arsenicals and sulfur. This situation naturally required the particular attention of the industrial hygienist, who has steadily assumed a more important role in the pesticide plant. The fine job done by this group of workers is evidenced by the minimum number of accidents due to pesticide poisoning.

William R. Bradley, American Cyanamid Co., New York, reported on "Industrial hygiene control in the manufacture, distribution and use of pesticides." The control of employees in plants, and controlled environment in formulating plants has proven economically desirable and worth while. Mr. Bradley reported on the many publications directed to users, aerial and ground applicators, customers and physicians, which include information on cautions, precautions, symptoms and antidotal treatment, etc. in handling toxic pesticides. The literature is issued by pesticide producers, the USDA, and the various trade associations.

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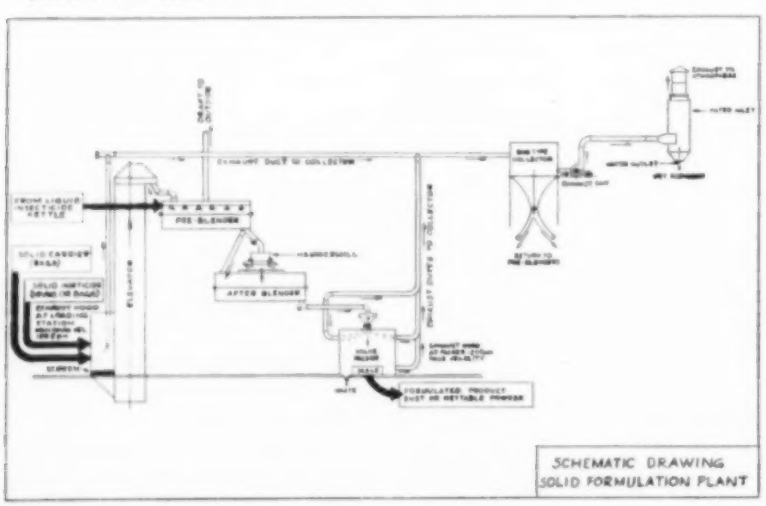
Protective Treatments for Corn

A study of the effectiveness of malathion emulsion sprays and methoxychlor dusts in protecting shelled corn from insect attack during an 8-month storage period in the Southeast was carried on from May 1957 to February 1958. Malathion emulsion sprays were applied at 5, 10, 15, and 20 parts per million (p.p.m.) of technical premium grade malathion; and methoxychlor dusts were applied at 12.5, 25, 50, and 100 p.p.m. of technical methoxychlor.

The percentage of damaged kernels increased in all treatments during the 8-month storage period; however, less kernel damage was noted in the 10, 15, and 20 p.p.m. malathion treatments than in the other treatments. There were decreases in the test weights in all cases. The decrease in the corn treated with 20 p.p.m. of technical malathion, however, was slight. Results of examinations of the probe samples showed that malathion, at all rates of application used, was superior to the methoxychlor treatments. Fewer insects were found in the malathion treatments than in the methoxychlor-treated corn.



SCHEMATIC DRAWING
SOLID FORMULATION PLANT

USDA, ARS, Marketing Research Report #357. Prepared by H. Womack and D. W. La Hue, Tifton, Ga.

Success of NPFI's educational project in Mid-West in evidence as salesmen report immediate sales of fertilizer, lime

By H. H. Slawson

THE National Plant Food Institute's program for promoting increased use of fertilizer through demonstrations on test plots is resulting in increased sales for the fertilizer industry. This was revealed in reports on two such 1959 demonstrations presented at the annual conference between midwestern college agronomists and the fertilizer industry, held in Chicago, Feb. 11 and 12. The meeting heard also a report on the dealer's place in the sales promotion drive, and a review of recent research progress.

Guernsey county, Ohio, was given the lead off spot in the story of how the NPFI educational project is showing farmers the value of fertilizer on their fields. Oscar Share, county agricultural agent, and Harry Cook, Farm Bureau Cooperative Assn., Columbus, O., outlined the mechanics of the "Operation Production" project which started with organization of the Guernsey County Agronomists Committee. Members included lime, fertilizer and seed dealers as well as representatives of the extension services, soil conservation service, vo-ag teachers and others.

In preparation for the drive, three fertilizer short courses were held to train dealers in taking soil samples and interpreting soil sample results. NPFI provided 88 soil sampling probes and 1,000 copies of their booklet on "How To Take A Soil Sample."

County Fertility Week was officially proclaimed and a publicity campaign was conducted to interest farmers and enlist community support. One newspaper carried a special 10-page supplement, dealing with the project. Soil collection stations were established at 37 points in Guernsey county and 665 soil samples were processed in Ohio State's soils laboratory. Soil sampling was the foundation of the project. Demand for use of the probes was so great that they had to be reserved in advance.

In this soil fertility drive, said Dr. Shoemaker of Ohio State University, it was shown that farm income in Guernsey county could be increased by $1,000,000 a year. A final survey has not yet been completed on the increased volume of lime and fertilizer sold. One lime dealer, however, reported that in two months following the campaign he spread more lime than during the entire previous year. Some fertilizer dealers, too, could not keep up with calls for plow-down nitrogen for corn and had to suggest side dress applications. A second such Soil Fertilization Week is set to open March 21 of this year.

The Miami County, Ohio, fertilizer demonstration program was described by Dr. Gordon Ryder, Ohio State University agronomist as the biggest such project conducted in any one county in the U. S. The program included 47 corn demonstration plots, and 10 pasture fertilization tests, in which 57 farmers cooperated. It was unique, he said, in that the farmers bought their own fertilizer for use in the demonstrations, while 18 fertilizer dealers doing business in Miami county loaned 23 salesmen to serve as demonstration supervisors. Over 600 persons attended various meetings or took the tours to examine the demonstration plots.

The salesmen-supervisors, it was explained by Norman Arnold, county agent, took soil samples, explained test results to the farmers, located and staked out the test plots, and helped the farmer figure out kind and amount of fertilizer to use. The program, said Arnold, gave the industry and the farmer an opportunity to get together on a job of public relations that worked both ways. One farmer commenting on his dealings with his salesman-supervisor, said "I don't even use his brand of fertilizer and he never mentioned it, never tried to sell me any of it."

H. H. Tucker of Sohio Chemical Co., Lima, O., and member of the Institute's education committee, in summarizing results with a bearing on the industry's future in Miami county, stressed the project's three-fold value,—education, improvement of public relations and sales value. The salesmen-supervisors, he said, gained a better understanding of how their products were used and the factors affecting yield results, such as use of a poor variety corn, water supply, weeds and management. One sales manager said he had hesitated to loan one of his salesmen, because it would take too much time away from selling. Later he admitted "I never realized how it could help my staff."

As to results in sales, Tucker said that the test plot farmers are now spreading fertilizer over their entire fields, instead of just the 10-row test plots, and are also beginning to use the recommended formulas on other fields as well. "The demonstrations can do more in less time," he said, "to shorten the lag between the time the college agronomists make recommendations and the application of these recommendations on the farm."

Fertilizer Research Reviewed

FOUR research projects were presented on the conference program, with Dr. J. F. Davis appearing for Michigan. Dr. S. A. Barber for Indiana, Dr. C. M. Woodruff for Missouri and Dr. L. O. Fine for South Dakota.

In yield building tests in Saginaw county, Mich., Dr. Davies related, 600 lbs. of NPK per acre were applied in a band to the side

and an inch below seed level. The method, he explained, puts the nutrients within easy reach of seedling roots without direct contact with the seed. Early growth of sugar beets, he indicated, can be increased three-fold by adequate fertilizer. Michigan farmers, he said, are applying an average of 587 pounds of fertilizer to sugar beets.

A. H. Bowers of Swift & Co., Chicago, in commenting on the significance of the Michigan work from the industry's standpoint, stressed that "It is now possible to grow crops on mineral soil, but it takes a lot of fertilizer." Dr. Davis had described the use of plastic strips two feet down and these, Bowers said, have many possibilities that should create a market for more fertilizer. He suggested that the Michigan station bulletin No. 159, should be in the hands of every salesman. "It will make him a muck soil specialist," he declared.

Dr. S. A. Barber, Purdue agronomist, said as a result of research in Indiana rates of fertilizer application have increased from 135 to 185 pounds per acre in the last 10 years. The fertilizer industry has also increased plant food content from an average of 26 units to 40 per ton, so he figured that this combination means a 120 percent increase in actual per acre use of plant nutrients.

Two Iowa State University rural sociologists, Dr. Joseph M. Bohlen and Dr. George B. Beal, presented to agronomists a report on their study of the fertilizer dealer's place in increasing fertilizer consumption. After questioning 118 fertilizer dealers and 315 farmers, their conclusion is that "dealers play a key role in influencing farmers' decision about fertilizer use."

Progressive dealers, the Bohlen-Beal survey found, sell above average amounts of fertilizer; offer more educational services, such as soil sampling, fertilizer clinics and test plot demonstrations, and offer more spreading services. Dealers

(*Continued on Page* 121)

USDA Clears Heptachlor Use on Food Crops

CONTINUED use of heptachlor on a series of food crops was made possible by action of the U. S. Dept. of Agriculture, February 9, giving official departmental approval to employment of this widely used soil pesticide on corn, cotton, fruit, berries and other edible crops. Use is prescribed in such a manner as will avoid residues at harvest time,—thus being in compliance with the recent F.D.A. ruling, which prescribes a zero tolerance for heptachlor and heptachlor epoxide.

Use of heptachlor for the control of grasshoppers or other insects in pastures and on range land will also be approved, with the restriction that dairy animals cannot be grazed on treated land, and cattle being finished for slaughter cannot be grazed on treated land for 90 days following application of heptachlor. Other approved uses include use on tobacco, for seed treatment, and in protection of non-edibles such as turf, nursery stocks, ornamentals, etc.

Important former uses of heptachlor still not cleared include its use on forage crops, on cotton after the bolls have opened, and on potatoes and other root crops. Velsicol Chemical Corp., manufacturer of heptachlor, has indicated that it is still taking every necessary step to further broaden approved usage of the product.

In the announcement from U.S.D.A., which was issued over the signature of Justus C. Ward, Chief, Pesticides Regulation Branch, labeling and reregistration procedures were clarified. It will be necessary, for the protection of users, it was made clear, that "all stocks of heptachlor be relabeled with acceptable directions for use." Ap-

(*Continued on Page* 123)

Crop	Dosage	Limitation
Corn	3 lbs./A	Soil use only.
Cotton	1 lb. /A	Do not apply after bolls open. Do not feed treated cotton trash to dairy animals or animals being finished for slaughter.
Cotton	3 lbs./A	Soil use only.
Blackberries) Blueberries) Boysenberries) Cranberries) Dewberries) Raspberries)	4 lbs./A	No application while edible parts are present.
Citrus	4 lbs./A	Granular formula (under trees for Medfly control).
Citrus	3 lbs./A	Soil use only. Apply under trees without pressure.
Cherries	3 lbs./A	Soil use only—late spring, early summer.
Peaches) Pears)	3 lbs./A	Ground cover application in spring before petal fall.
Pineapples Lima beans)	3 lbs./A	Preplant soil application only.
Tomatoes) Peppers)	3 lbs./A	Soil use only. Do not apply after edible parts start to form.
Small grains	3 lbs./A	Preplanting soil use only.
Grass, pasture & range	3 ozs./A	Do not graze dairy cattle on treated areas. Do not graze animals being finished for slaughter for 90 days following treatment.

Press Critical of Flemming, Additives Bill

Secretary Flemming's action last fall, causing the cranberry panic, continues to stimulate strong editorial comment in the business and farm press. A change in the Delaney amendment and in its administration is urged.

FOLLOWING the recent crackdown by the U. S. Food and Drug Administration on pesticides and food additives under the "Delaney Amendment," a number of highly critical editorial comments have been carried in the Nation's press. While it is reported from Washington that the preponderance of mail received by Secretary Flemming from the general public has supported his drastic action in the cranberry and other associated controversies, farm groups, farm publications and those trained in the agricultural sciences by contrast have generally tended to be critical of the Secretary's action.

The *Farm Journal,* highly respected farm publication, said in an editorial in its February, 1960, issue "This Can't Be Allowed to Go On." Demanding a change in the Delaney Amendment, they say "The trouble with the law is simple: It leaves no room for scientific judgment." Pointing out that the Secretary of HEW is necessarily involved with political consideration, the *Farm Journal* observes that he "doesn't have many opportunities to make the front page. When something like cranberries or capons comes along, it's a temptation to call a press conference, toss the word 'cancer' about, suddenly achieve headlines and emerge as the great defender of the people."

Asking what can be done to remedy the present situation, *F. J.* suggests "first, we need a change in the Delaney Amendment. Second, we need a change in the administrative set-up. Third, farmers must absolutely follow labels – the responsibility is on them too. As to administration, we need to remove from the hands of any one man, particularly when he is a political office holder, (1) the power to panic American consumers with a mere ill-advised statement and (2) the power to lay low with one blow an entire segment of agriculture."

Barron's, national business and financial weekly, in its February 1 issue, captioned its editorial comment "Food and Drug Laws Need a Dose of Common Sense." Barron's also sees in actions like that of Sec. Flemming and other "ambitious politicos" a serious "threat to the advance of food technology, without which this nation never could have moved from the farm to the city."

In carrying out its responsibilities under the Food Additives Law, this publication charges, "FDA scarcely has proven a model of scientific objectivity: The agency has shown an unbecoming penchant for publicity. . . . Moreover, in screening substances for their carcinogenic qualities, its researchers have leaned heavily on experimentation with mice, a technique which, in the view of some independent experts is open to serious challenge. It also has bowed to the groundless prejudice, so popular among lawmakers, that artificial substances are apt to be more deleterious to health than natural ones (in fact, sunshine and eggs, to name two, have been found to be cancer-inducing).

"Finally, in its recent rulings, the agency has shown an appalling disregard for the simple precepts of common sense, to say nothing of the scientific method."

The *Congressional Record* for February 2 carried some caustic comments by Rep. Henry A. Dixon, former president of Utah State Agricultural College and now a Congressman from Utah. Referring to Sec. Flemming's recent efforts to enforce the strict provisions of the Delaney Amendment, Rep. Dixon said "Farmer groups want to use these needed chemicals. . . . They fear that the present interpretation of the Delaney amendment could virtually wreck U. S. agriculture as well as worsen rather than improve public health. The following are some of their arguments:

"First. Numerous common foods have been named as carcinogens, yet people eat them in quantity. . . . Is the Government then straining at the ridiculous to prohibit infinitestimal traces of many additives without any evidence of their danger to humans, when we eat in quantity other items which produce the same results?

"Second. Chemical companies are left in a quandary. The most minute measurement of a product may reveal no residue by measuring to 10 parts per billion, for example. Next year, however, new scientific methods may prove that by measuring to one part per million a chemical trace is proven, thereby prohibiting the chemical.

"Third. So much publicity has been given to the cancer scare that even routine Food and Drug actions are now causing financial losses to farmers, merchants, and companies. For example, one carton of Florida celery was found to be contaminated and was properly confiscated. However, although no further contamination was found, the Florida celery price dropped more than 50 percent.

"Another example is heptachlor which was tested and approved by USDA and Food and

(*Continued on Page* 121)

WITCH WEED

A NEW PARASITIC PLANT IN THE UNITED STATES

First infestation of this pest in the western hemisphere was discovered in the Carolinas in 1956. Like other introduced foreign pests, witchweed presented many problems for control, regulatory, and research officials.

The primary hosts of this pest in the United States are corn, sorghum and sugarcane — representing an annual crop value of five billion dollars. Unless curbed, witchweed could become a serious pest if allowed to spread to areas where the host crops are commercially important.

Witchweed seed may lie dormant in the ground for many years. The seed germinates only when it comes near, or in contact with roots of corn or other host plants. A parasitized plant slows in growth and shows acute symptoms of drought, even in the presence of sufficient moisture. A host plant is severly damaged by the pest. Individual witchweed plants are capable of producing up to ½ million seeds.

By Joseph E. Spears, Plant Pest Control Division, ARS, USDA, Washington, D. C.

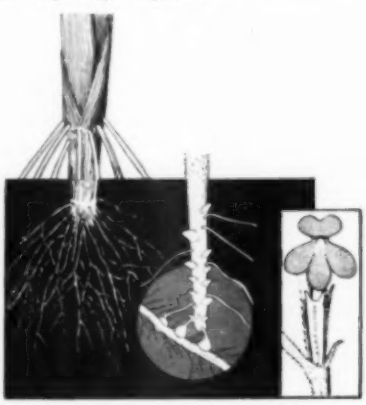
WHEN we speak of weeds, we often think of plants that are not known for their beauty, and which may even be unsightly. However, this does not hold true for a deceptively attractive plant, with bright green leaves and showy red flowers with yellow centers, that grows in the fields of North Carolina and South Carolina.

This plant is the subject of one of the largest weed eradication programs in the United States. The scientists call it *Striga asiatica*. The common name for it in this country is "witchweed." In South Africa it goes by two Afrikaans names, "rooibloemtjie" (little red flower) and "vuurbossie" (fire brand). This parasitic plant has long been known in that country for the damage it does to corn.

Witchweed was first discovered in the Western Hemisphere in North Carolina and South Carolina in 1956; however, farmers in the coastal plains of the Carolinas had complained to agricultural officials about steadily decreasing corn yields on some fields since 1951. In 1956, when scientists of the North Carolina State College of Agriculture were examining corn plants from some of these fields, a graduate student from India—assisting in the examination—noticed that attached to the corn root samples were plant parts, that resembled a species of witchweed that attacks sugarcane in the Eastern Hemisphere. With this lead, identification soon followed.

Just when and how witchweed entered this country is not known, but farmers living in the infested area believe that they had seen this plant in the fields since 1945. One theory is that witchweed seed may have been brought into the country on burlap bags, since empty bags were found on some infested farms labeled "Rhodesia Asbestos — Product of South Rhodesia" and "Capeblue Mines—Product of Union of South Africa." The bags were sold by a used bag dealer in Charlotte, North Carolina.

The sketch below shows the roots of a corn plant and an enlargement of a section of root showing how the haustoria, or sucking organ is attached to the host root. The insert (right) shows a witchweed flower and position of stem greatly magnified.



Witchweed is well known in the tropics and subtropics of the Old World. It has a wide host range, parasitizing corn, sorghum, sugarcane, and more than 60 species of the grass and sedge families, including rice, wheat, oats, and barley. There are several species of *striga*, and so far as is known, most of them are parasitic. Wherever this harmless-looking weed becomes established on host crops, serious damage occurs. The plant is common throughout the "maize triangle" of South Africa. In the Union of South Africa, damage to corn from witchweed is reported to be greater than that caused by all the fungus diseases and insects combined.

Witchweed seed may lie dormant in the ground for many years. The seed germinates only when it comes near or in contact with roots of corn or other host plants, which apparently secrete some substance which causes the weed seed to start growing. But even in the presence of host plants witchweed normally remains dormant for about 18 months.

The witchweed root develops a bell-shaped organ called a "haustorium," which penetrates the root

of the host plant and robs it of nutrients and water from the soil. A plant so parasitized slows in growth and shows acute symptoms of drought, even in the presence of sufficient moisture. In heavily infested fields, several hundred witchweed plants may parasitize the roots of a single host. Since one host plant cannot support so many witchweed plants, comparatively few survive and reach the surface. For about a month after the seed germinates, the witchweed grows entirely under ground.

By the time the witchweed emerges from the soil, the host plant has been severely damaged. A short time later, the witchweed puts out small red flowers. As the plant grows, a succession of flowers appear. Most witchweed plants grow 8 to 10 inches tall, and occasionally as high as 18 inches.

Within a month after the first flowers open, the seed pods burst and the seeds, which are microscopic in size, are scattered. It would take six tiny seeds laid lengthwise to span the period at the end of this sentence. Individual plants are capable of producing up to one-half million seeds. In heavily-infested areas, 50,000 to 3,000,000 seeds per square yard may be distributed in the soil to a depth of 9 inches. Much like the spores of a rust fungus, the seeds are easily distributed by wind and other carriers.

Witchweed seems to prefer light, moist soils and warm temperatures, but it has shown ability to grow under a wide range of soil, moisture and climatic conditions.

Official notification of witchweed's occurrence in North Carolina was received in the Agricultural Research Service on September 21, 1956. Considering its potential threat to susceptible crops, their high economic value, and the devastating effects the plant parasite can have on them, the first step in appraising the problem was to inaugurate a field-by-field survey to determine the extent of the

• Field of corn severely damaged by witchweed. The grass-like plant shown here is witchweed.

• This is one of the 35 high-clearance row-crop sprayers used for applying the amine salt of 2,4-D to cornfields to prevent witchweed from going to seed.

• In areas inaccessible by motorized equipment the herbicide was applied by hand. Here a 6-man crew is killing witchweed. A total of 650 3-gallon knapsack sprayers were used by the hand crews during the season.

• The jeep-mounted sprayer shown here is spraying roadsides with 2,4-D to keep witchweed from going to seed.

• This is a view of a corner of a warehouse where 5-gallon cans of 2,4-D are stored. Over 60,000 gallons of 2,4-D were used against the witchweed in N. Carolina during the crop year 1959.

infestation. By October 15 survey teams were in the field. Because of the lateness of the season, the survey was limited and had to be terminated with the first killing frost; however, it established the presence of the pest on 79 farms in 4 counties in North Carolina, and 38 farms in 4 counties in South Carolina.

Surveys were carried out on a more extensive basis in 1957, and the following years revealed that the principal infestation was in corn, although witchweed was found parasitizing crab grass along roadsides and in fence rows, in wastelands, and on crab grass in cultivated land used for growing cotton, tobacco, and peanuts.

Infested counties are contiguous. The infestation pattern established during the past three years indicates that witchweed is confined to the closely-knit rural trade areas, and that it is spread largely through the movement of products to market, or by the movement of farm machinery. Local spread between fields and from one farm to another appears to have occurred through windblown soil or through routine farming operations. To date, infestations are known to occur in 15 counties of North Carolina involving 4,703 farms, and 7 counties in South Carolina involving 1,391 farms.

In an effort to prevent further spread and to hold the infestation within its known limits, a Federal quarantine was invoked on September 6, 1957. The quarantine regulates the interstate movement of any article or thing which presents a hazard of spread. Articles so regulated may be moved from the area under certificate when they have been fumigated, or when they have received other approved treatments which render them free of witchweed seeds. The infested states of North Carolina and South Carolina have promulgated parallel state quarantines, describing the rules for the intrastate movement of regulated articles. It is believed that the measures prescribed under the quarantines will prevent dangerous movement of known infested materials, and at the same time allow growers to continue normal production and harvesting procedures with very little interruption.

Like other introduced foreign pests, when witchweed was discovered in the United States it presented many problems for control, regulatory, and research officials. Because of lack of information in this country about witchweed, assistance was requested from countries where it was known to occur. The governments of the Union of South Africa and the Anglo-Egyptian Sudan assisted by providing research findings pertaining to cultural and chemical control methods.

Dr. A. A. Saunders, a witchweed authority from the South African Department of Agriculture, who was in the United States shortly after witchweed was found, visited the infested area in the Carolinas. He stated that we may have to learn to live with witchweed, but that we should try to get rid of it at any cost. In view of the fact that corn, sorghum, and sugarcane, the primary hosts of the pest in this country, are important crops with an annual value of 5 billion dollars, it is easy to see why he held this opinion. There is every reason to feel that witchweed could become a serious pest, particularly to the primary host crops, if it is permitted to spread to areas where these crops are commercially important.

In view of these factors, a decision was reached to adopt a program that would contain the pest, and progressively eradicate it, as means become available. The methods we are now using for the eradicating of witchweed are based on a fundamental understanding of the biology of the plant and the host-parasite relationship.

Two methods are being employed in the witchweed eradication program:

(1) *Cultural method.* The principal points considered in establishing a program of control were: (a) preventing development of seed and seed dispersal, and (b) eliminating seed already in the soil by planting corn, Sudan grass, or sorghum which stimulate seed germination. These "catch" crops must be destroyed before the witchweed flowers produce seed. This method of control can be very effective. Timing destruction of "catch" crops is important. Certain plants, principally legumes, will stimulate the germination of witchweed seed, but the plant is unable to grow to maturity. Cowpeas, soybeans, peanuts, castor beans, flax, and sunflowers secrete a substance that can cause seed to germinate but the parasite is unable to support itself on the host plant after germination. These "trap" crops can be used effectively for witchweed control when grown on infested fields for four to five seasons.

(2) *Chemical control.* Properly-timed applications of certain weedkillers are effective in eradicating witchweed. Postemergence treatments of 2,4-D, applied to infested cornfields at the rate of ½ to 1 pound per acre just before witchweed begins to flower, have proven successful. The application of 2,4-D and certain other weedkillers was used successfully in wasteland, in open areas such as fence rows, and roadsides.

It was not known whether control methods used in Africa and Asia would be effective in the United States. To determine this, a field test eradication program was initiated in 1958 in North Carolina and South Carolina. Pilot operations were established on 1,000 acres of cultivated and 5,000 acres of noncultivated land on 68 farms in 14 counties of the two states. The plan involved the withdrawal of the land from normal farm production. Farmers agreed to carry out recommended cultural practices under contract. The cultural program was supported by

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National, state and local —

TRADE ASSOCIATIONS
how they reflect our future success

By J. J. Davis Purdue University, Agricultural Experiment Station, Lafayette, Ind.

"EVERY man owes some of his time to the upbuilding of the profession to which he belongs." No truer statement could have been made by that great statesman, Theodore Roosevelt. It is equally true that every man owes his support to organizations which sponsor the trade or profession from which he receives his livelihood. How much better and how much more important it is to support one's profession than to seek membership in social and service clubs because of their social or political influence.

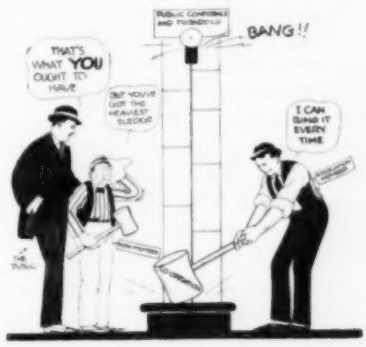
Support of one's profession should come automatically, but let us analyze the benefits and aid you receive from your local, state, and/or national association, if we must be selfish about it.

The increasing emphasis on and support of trade organizations is in itself evidence of their value. Please understand, I do not refer to political and forceful power exerted by some industrial or labor unions, which is so often harmful to the economy of our nation. Let us think of the value of organizations as the American Medical Association and the American Chemical Society, where perhaps 90 per cent of the persons in the professions are members.

My remarks, here recorded, refer especially to National Agricultural Chemicals Association (NACA), Western Agricultural Chemicals Association (WACA), National Plant Food Institute (NPFI), National Aviation Trades Association (NATA), Entomological Society of America (ESA), and National Pest Control Association (NPCA), but they refer equally well to all national and state trade associations. As I check the membership lists I am ashamed to note so many prominent in their professions, who receive their livelihood from their professions, who are not members of their national associations, and yet get and expect the benefits of their association.

May we again note that these national associations were established by unselfish men in your industry and are acting for your benefit. Such lack of interest and support is hard to understand. And as I have said, many of these persons expect and automatically get the benefits provided by the organizations.

Before the days of our associations, we all went our separate ways and not too much progress was made. As a member of the National Pest Control Association put it, "I can remember when we each were suspicious of the other. Now, one of the first things I do is to call on our friends in the business and never fail to get a good reception. The old barriers have broken down and suspicion has largely vanished and a fraternization has developed which is valuable to all beyond description."



Again—"When we united our efforts, things began to happen in our industry. The organization of what is now known as the National Pest Control Association drew together widely scattered and often antagonistic operators into a sound and mutually beneficial organization."

And what has the Association accomplished? Being more familiar with the National Pest Control Association, may I use it as an example, which can be duplicated by every other national association.

Many do not recall the wartime days when the Association, through hours of labor by Bill Buettner, was able to get an essential classification for the pest control industry which made it possible to secure allocations of needed chemicals, tires, gas and other restricted equipment and supplies for the industry.

Public relations, which Bill Buettner and others promoted throughout the years, have done much for our entire industry. The progress during the past 20 years has done much to increase public knowledge of pest control and acceptance of the benefits of pest control services.

The Association has sponsored

(*Continued on Page* 112)

Southeastern Liquid Fertilizer Conference

TVA and fertilizer industry representatives report on agronomic values of liquid fertilizers, production and application technology, the liquid fertilizer market, handling and application problems, economic considerations in use and manufacture.

An engineer and economist point out that from a cost viewpoint alone, advantage appears to favor solid fertilizer manufacture, as compared with production of liquid fertilizer. Cost, however, is only one criterion, and merchandising and convenience aspects of liquids afford other yardsticks for determining the potential.

Agronomically, there is no difference in whether solid or liquid forms are used of such materials as ammonium nitrate, ammonium phosphate and muriate of potash. Certain characteristics of liquid fertilizers, however, should be taken into account for most effective and efficient use of this increasingly popular fertilizer form.

Part 1 of "Agricultural Chemicals'" report on the Southeastern Liquid Fertilizer Conference

"LIQUID fertilizers have attained considerable prominence in the past decade, compared with solid fertilizers," remarked Arthur V. Slack, TVA research supervisor, in addressing some 300 members of industry and state extension workers at the Southern Regional Liquid Fertilizer Conference held February 8-11 at the Rock Eagle 4-H Club Center, Eatonton, Ga., "Liquid fertilizer," he said, "has advanced to a challenging position, accounting for about half of the total nitrogen used in direct application in 1958." Liquid mixes in California today, account for about 26 per cent of the total mixed fertilizers used in that state. It is estimated that there are 256 plants producing liquid mixes in the central and eastern parts of the country,—and with the far west included, there are about 354 plants.

The growing use of fertilizer in liquid forms may be expected as a development in keeping with modern technology," observed Mr. Slack. Savings in labor and handling costs are among the factors that make use of liquid fertilizers attractive, and are the main advantages.

Consumption reports show that anhydrous ammonia occupies a more important place in central and western states than it does in east. Total consumption in 1957-58 was about 479,000 tons of nitrogen, as compared to 377,000 for ammonium nitrate, the runner up. Nitrogen solutions are more popular in the south atlantic and west north central states. Total consumption of liquid mixes is estimated at over 800,000 tons. This probably represents about 200,000 tons of plant food, or about 4.5 per cent of that applied in the form of mixed fertilizers.

Thus it is clear that liquid mixes have not made the inroads in the mixed fertilizer field that anhydrous ammonia and nitrogen solutions have in the direct application field. One reason, of course, is that liquid mixes are newer in most sections than the nitrogen liquids. A major difference, however, is that the latter usually can be produced and sold for less cost than for comparable solids. This is not the situation with liquid mixes; these normally cost as much or more to make than solid mixes, and must depend on convenience and saving in handling and application as their main advantage.

Availability of phosphoric acid during the rush production season in spring appears to be one of the major current problems in the liquid mixed fertilizer industry. Most producers have tried to keep expensive acid storage at a minimum and have depended on the acid supplier to deliver acid when needed. This worked fairly well in the beginning of the industry but as the demand for acid has grown, both for liquid and solid mixes, the supply situation during rush seasons has become critical.

Raw material cost is also a problem. The trend is to the use of urea-ammonium nitrate solution rather than urea, as a means of reducing cost for supplemental nitrogen, even though the grade is usually lowered thereby. The main raw material cost problem, however, is in regard to phosphate. The lower cost of wet-process acid in most areas has led to a major effort in finding ways to use it.

(TVA is conducting a series of studies on use of wet process acid for liquid fertilizers. The subject was discussed at the TVA pilot plant demonstration last year*).

Mr. Slack pointed out that a continuing problem in liquid fertilizers is the relatively low analysis attainable as compared with solid mixes. Progress is being made, however, toward solving this problem. The various approaches include: (1) use of ammonium nitrate with urea to raise the grade; (2) adjusting the NH_3/H_3PO_4 ratio which has a significant effect on solubility in low potash grades; (3) use of superphosphoric acid to increase solubility; (4) increasing solubility for potash grades by using KOH or K_2CO_3 instead of KCl; (5) exceeding solubility of the nutrient salts and treating salted out constituents to produce a stable suspension.

* AGRICULTURAL CHEMICALS pp 24-26, July, 1959 and pp 43-45, August, 1959.

Comparative Agronomic Values in Solid Fertilizers

WHETHER such materials as ammonium nitrate, ammonium phosphate, and potassium chloride (muriate of potash) are applied as solids or in water solutions should not affect their agronomic value,—remarked J. T. Cope, Jr., agronomist at Auburn University, Ala. He indicated, however, that certain characteristics of liquid fertilizers may affect their efficiency under some conditions:

(1) Water solubility of phosphorus. Very few cases have been found where more than 50 or 60 per cent water solubility of phosphorus is beneficial. In solid fertilizers, a high proportion of the phosphorus is water-insoluble in form, — this phosphorus is less quickly available on application to the soil. It should be remembered that this property might be important for seedlings on deficient soils, where a readily soluble source is needed.

(2) Sulfur. Materials being used in liquid fertilizers do not contain sulfur, while solid mixed fertilizers do have this nutrient as an inpurity in the superphosphate. Since many southeastern solids are low in this element, sulfur might have to be added to liquid fertilizers, or some application of sulfur (such as gypsum) would have to be made to the soil.

(3) Acidity. Nitrogen and phosphorus used in liquid fertilizers are acid forming, — which increases the importance of an adequate liming program.

(4) Placement. Liquid fertilizers are not as adaptable to row placement as solids. Most of the liquids are applied broadcast, and are often applied too far in advance of the time they can be utilized by the crop plants. This subjects them to excessive losses from leaching, volatilization, and erosion.

By recognizing the advantages and limitations of liquid fertilizers, —intelligent use will prove the liquid mixed fertilizer a very economical fertilizer form, concluded Mr. Cope.

The Southeast A Failing Market—Tremendous Recovery Potential

SOILS of the southeast have long been recognized as being basically low in fertility, thus, the fertilizer industry essentially grew up in this area,—observed E. T. York, Alabama Extension Service.

During the past twenty years, however, the pattern of fertilizer use has changed considerably. Today, the southeast uses only about 30% of the total plant food consumed nationally, compared with some 55% in 1940. In the period 1940-1958 plant food consumption in the five midwestern states of Ohio, Indiana, Illinois, Michigan and Wisconsin rose some 614%, while increasing only 128% in the southeast. For the period 1950-1957, expenditures for fertilizer in the midwest gained 45%,—in the southeast only 9.2%.

"The southeast also has by far the lowest consumption of granulated fertilizers as compared with any other section of the country, remarked Mr. York. "Only 7% of the farmers contacted in a recent survey conducted in Alabama, indicated that they were using granulated fertilizer." By contrast, essentially all fertilizer in the midwest is now granulated.

In further describing the falling fertilizer volume in the southeast, Mr. York pointed out that during the 1943-1958 period, the average analysis of all mixed fertilizers in the five south atlantic states increased less than 6 units, from 18.8 to 24.5. The average analysis of mixed fertilizer in the other four southeastern states increased only 6 units also, to 26.9 during this period. However, average grades in the five midwestern states increased some 14 units, from 22.7 to 36.8

"There is much evidence that we are falling far short of using the fertilizer needed for most efficient crop production here in the southeast," said Mr. York. "In many states, consumption would be increased by two to four times if all recommendations were followed. Furthermore, within the range of recommended usage, there is ample evidence that a farmer can expect to get a return of $2, $3, $5 or even $10 for every dollar invested in fertilizer. Furthermore, fertilizers have never been a better buy. In terms of all prices paid by farmers, fertilizer is now only one-half as costly as it was in the 1911-14 period."

Tradition—A Stumbling Block

"WHY then," the speaker asked, "are we not using more nearly the amount of fertilizer needed here in the southeast,—why are other areas moving ahead in fertilizer usage at a faster rate than we are?

Photo captions

Top Photo, (l to r): R. Wehunt, TVA; J. F. Reed, American Potash Institute; and C. Camp, Nitrogen Division.

Center photo, (l to r): H. Walkup, TVA Knoxville, Tenn.; W. W. Arnold, Nitrogen Div., Indianapolis, Ind.; A. V. Slack, TVA, Wilson Dam, Ala.; and E. M. Harper, Aylco Fertilizer Co., Sullivan, Ill.

Bottom photo, (l to r): H. Guest, Macon County Truck and Tractor Co., Oglethorpe, Ga.; M. Woosley, Western Kentucky Liquid Fertilizer Co., Hopkinsville, Ky. and R. Sasser, assistant county agent, Kenansville, N. C.

"In my opinion, the principal reason for this is primarily tradition. Fertilizer use is old stuff to us here. We already know all about fertilizers,—we have been using them for fifty years or longer. Consequently we don't have to be too much concerned about new forms, new analyses, or new rates. 'What I have been using gave good results—let's don't change'."

This is what is wrong with the cotton situation, Mr. York suggested, pointing out that almost 20% of the 165,000 acres alloted to Alabama for cotton were not planted in 1959. Average yields (cotton) are about 400 lbs.—but "with steadily increasing costs, the average farmer can't expect to make a profit with such low levels of production." Mr. York cited several examples which show southeastern farmers are actually uninformed about fertilizers,—primarily because they have been using fertilizers so long. "*they think* they know all they need to know about the subject. Consequently, it is a particular difficult task to reach them.

"We are going to have to give more attention to the group of farmers we ordinarily don't reach in the normal course of events," he added. "The ones who attend our meetings and demonstrations, request our publications, or come to us for advice are usually the ones who need our help the least. We must direct more attention to that group that usually constitute our poorest farmers, the lowest producers, and of course the lowest users of plant food. This is a very important group; in fact, they may constitute 50% of the farmers."

In conclusion, the speaker urged that a greater effort be expended in an educational program in soil fertility. "Agriculture is not a dying business in the south," he said. "I'm convinced that we have the resources to compete with any section of the country, provided we make use of these resources and all the technology at hand to enable us to operate with the maximum possible efficiency."

Cost of Producing Liquid Fertilizers Higher than for Solids

A DISCUSSION based on cost estimates made for hypothetical plants for producing liquid and solid mixed fertilizers at four locations in the southeast was presented by H. G. Walgup, an agricultural economist, and N. L. Spencer, a chemical engineer, both TVA. The cost estimates, they explained, are based on current costs of operations, raw materials, plant investment, – and include storage costs at plant, distribution to the farmer (not application on the farm), and conversion into finished product during a specified period of plant operation.

A chart comparing costs of the solid and liquid fertilizers appears on this page. Messrs Walkup and Spencer point out that the liquid plant is assumed to utilize a 1000-gallon reaction tank and have an annual output of 5000 tons. The cost of plant is estimated at $64,500. The plant for producing solid non-granular fertilizers is estimated to cost $200,000 and to have an annual output of 30,000 tons. The speakers concluded that: "(1) the cost of producing and distributing solid grades in the Southeast are usually less than for comparable liquid grades, and (2) the liquid grades having a low nitrogen to P_2O_5 ratio are most costly to produce than corresponding solid grades. However, as the ratio of nitrogen to P_2O_5 approaches a one-to-one ratio, the cost difference decreases and then disappears.

"The chief reason that the costs of liquid grades of low nitrogen content usually are higher than for corresponding solid grades is the high per unit cost of P_2O_5 in

COMPARISON OF COSTS OF SOLID AND LIQUID FERTILIZERS

(Includes costs of raw materials, manufacturing, and distribution to farm)

	Decatur, Alabama					
Grade	4-12-12	4-12-12	8-8-8	8-8-8	6-8-8	6-8-8
Type	Solid	Liquid	Solid	Liquid	Solid	Liquid
Total raw materials, $/ton	25.10	32.58	26.24	29.33	23.03	26.48
Manufacturing cost, $/ton [a]	6.32	3.18	6.32	3.18	6.32	3.18
Distribution cost, $/ton	5.00	5.00	5.00	5.00	5.00	5.00
Total, $/ton	36.42	40.76	37.56	37.51	34.35	34.66
Total, $/unit	1.30	1.46	1.57	1.56	1.56	1.58

	Moultrie, Georgia					
Grade	4-12-12	4-12-12	5-10-15	4-8-12	6-12-12	5-10-10
Type	Solid	Liquid	Solid	Liquid	Solid	Liquid
Total raw materials, $/ton	24.63	34.67	26.26	27.43	27.45	31.23
Manufacturing cost, $/ton [a]	6.32	3.18	6.32	3.18	6.32	3.18
Distribution cost, $/ton	5.00	5.00	5.00	5.00	5.00	5.00
Total, $/ton	35.95	42.85	37.58	35.61	38.77	39.41
Total, $/unit	1.28	1.53	1.25	1.48	1.29	1.58

	Hopkinsville, Kentucky					
Grade	10-10-10	9-9-9	4-12-8	4-12-8	6-12-12	5-10-10
Type	Solid	Liquid	Solid	Liquid	Solid	Liquid
Total raw materials, $/ton	35.37	32.97	25.50	30.80	30.38	29.93
Manufacturing cost, $/ton [a]	6.32	3.18	6.32	3.18	6.32	3.18
Distribution cost, $/ton	5.00	5.00	5.00	5.00	5.00	5.00
Total, $/ton	46.69	41.15	36.82	38.98	41.70	38.11
Total, $/unit	1.56	1.52	1.53	1.62	1.39	1.52

	Goldsboro, North Carolina					
Grade	5-10-10	5-10-10	3-9-9	3-9-9	8-8-8	8-8-8
Type	Solid	Liquid	Solid	Liquid	Solid	Liquid
Total raw materials, $/ton	25.31	32.43	21.04	27.11	28.80	31.49
Manufacturing cost, $/ton [a]	6.32	3.18	6.32	3.18	6.32	3.18
Distribution cost, $/ton	5.00	5.00	5.00	5.00	5.00	5.00
Total, $/ton	36.63	40.61	32.36	35.29	40.12	39.67
Total, $/unit	1.47	1.62	1.54	1.68	1.67	1.65

[a] For solid fertilizers, the manufacturing cost includes $3.00 per ton for bags.

electric-furnace phosphoric acid used in the liquid formulations. This acid delivered at the sites considered ranges in price from \$1.76 to \$2.00 per unit of P_2O_5. Normal superphosphate used to provide P_2O_5 in the solid formulations, on the other hand, ranges from \$0.93 to \$1.20 per unit.

"The reason that the costs of the high nitrogen to P_2O_5 solid grades considered in this study are generally not greatly different from the costs of the high nitrogen to P_2O_5 liquids is that, in the formulations used for solid grades, the nitrogen required above that supplied as ammoniating solution is supplied as ammonium sulfate, which costs from \$1.80 to \$2.14 per unit of nitrogen. On the other hand, the supplemental nitrogen for liquid grades of a high nitrogen to P_2O_5 ratio is supplied as urea-ammonium nitrate solution which costs from \$1.34 to \$1.43 per unit depending on the location of the plant.

"These cost conditions for phosphate materials and supplemental nitrogen materials account principally for the changes in relative costs between solid and liquid grades as we change from low to high nitrogen to P_2O_5 ratios.

"In developing the foregoing analysis," they added, "an attempt has been made to utilize conventional equipment, formulations, and practices to estimate meaningful cost comparisons between solid and liquid grades for the Southeast. From a cost viewpoint alone, the advantage appears to favor solids. We recognize that this is only one of the criteria for assessing the future for liquid fertilizers. The merchandising and convenience aspects of liquids afford other yardsticks for determining their potential."

Discussing raw materials for liquid fertilizer manufacture, Ernest M. Harper, Aylco Chemical Co., Sullivan, Ill., reported that manufacturers can anticipate adequate supplies of all three elements in 1960. "Potash," he said, "has the capacity and production called for; the nitrogen industry has the capacity and is developing the storage and transportation to handle all the business that can be developed."

On the other hand, stated Mr. Harper, phosphate producers, particularly those making furnace grade acid, have not had an opportunity to expand with the increasing demand. It may be expected that the shortage of phosphate raw materials will be relieved with new plants or increased production, along with the ability of liquid fertilizer manufacturers to use other P_2O_5 carriers. "The liquid manufacturer must work closely with his supplier. Storage expense is as necessary as the expense for trucks and buildings. In the liquid fertilizer business, good planning and thorough planning will pay big dividends as in any other venture. The desire, initative and objective of each man will determine the future of the liquid industry, not the short term supply situation."

Compared with other sections of the U. S., southeastern farmers, in general, have been backward in using recommended fertilizer rates, or using improved and higher analysis fertilizer. Of 350 liquid fertilizer plants in the U. S., less than 10% are in the south, less than 5% of the granular fertilizer plants are in the south.

Report to be concluded in April Agricultural Chemicals

At left a Hahn hi-clearance sprayer, self propelled. Below, plastic, collapsible storage suggested for liquid fertilizers.

Pictures on this page show some of the equipment displayed at the liquid fertilizer conference. Below: spray rigs and tanks for liquid fertilizers.

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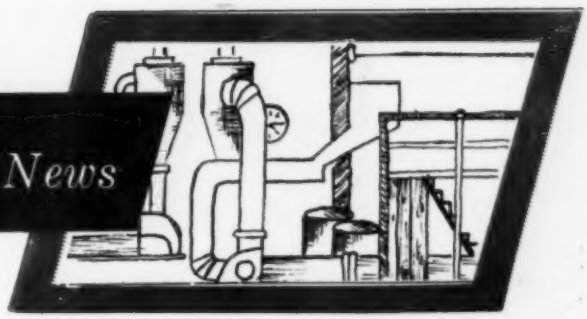
Fertilizer Views and News



Forest Fertilization Task Force Investigates Market Potential

THE fertilizer industry in recent years has been interested not only in increasing fertilizer use among farmers,— but in finding new markets for fertilizer products. Forest fertilization is among the potential markets being investigated, particularly since the American forest industry has recently exhibited interest in fertilization as a means of increasing wood production.

The National Plant Institute has inaugurated a program to determine the status of forest fertilization research in the southern United States, since the greatest potential for production of second-growth timber is in the south. A Task Force appointed by NPFI has been assigned to accumulate information on forest fertilization work now underway, and work planned for the future. This group has just prepared a preliminary report in which they point out that "Before forest fertilization becomes an accepted practice, and, therefore, economically feasible, reliable data must be obtained relating growth responses to applications of the various plant nutrient elements under a wide range of soil, site, and stand conditions. It is in expediting this needed research", they conclude. "that the clearing house on forest fertilization and the suggestions of the Task Force can perhaps be most effective.

A clearing house established by the Forest Fertilization Task Force is designed to accummulate research on forest fertilization and keep those persons interested in this topic informed of work in progress and of new work initiated. Persons or organizations wishings to participate in the clearing house submit an outline of fertilization studies initiated, including objectives, experimental design, treatments, location, etc. Periodically this information is assembled and distributed. To be on the mailing list, one is obligated to submit information on his own work.

A preliminary survey indicates that under some conditions forest species will respond to applications of fertilizer containing some or all of the three major plant nutrient elements. Present data, however, are not adequate to permit a prediction of the frequency or extent of these growth responses. Consequently, information on the economics of forest fertilization is almost completely lacking.

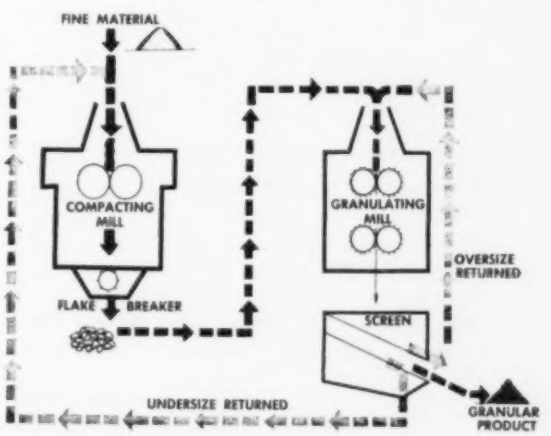
For further information on the NPFI program, readers are asked to write directly to the National Plant Food Institute.

Allis-Chalmers Suggests Compacting Fertilizer Fines

COMPACTING of fertilizer salts to upgrade and/or densify fine particle sizes is meeting with a high degree of acceptance by basic fertilizer producers according to engineers of the Allis-Chalmers Manufacturing Co., Milwaukee.

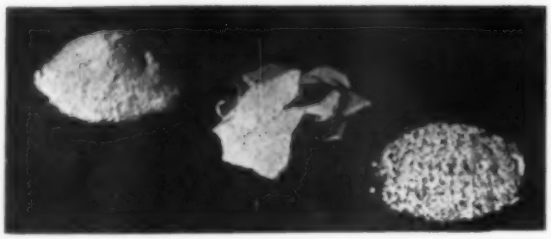
In disclosing some of the operating data from potash, ammonium sulphate, di-ammonium phosphate and similar plants presently using the A-C continuous compacting system, Allis-Chalmers also indicated that its engineers are conducting feasibility studies for the method as applied to blended fertilizer production.

Basically, the Allis-Chalmers compacting system agglomerates "fines" by passing them between smooth rolls capable of exerting pressures great enough to produce a solid ribbon for subsequent granulation to desired particle size. While flows may vary according to raw material feed size, preheating



Flow diagram showing how the compacting mill fits into a fertilizer operation.

COMPACTING PROCESS FLOW



Compacted salt from fines. (1) —30 mesh fines. (2) compacted salt flakes. (3) granules salt-screened at 10-mesh. 80-90% recovered as 10 mesh product.

requirements, moisture and curing requirements, compacting process flow is most often a closed-circuit arrangement between compactor mill, granulating mill and screen.

Allis-Chalmers advises the product is readily acceptable commercially. It is free-flowing and granular with close control of product size, shape and density. Packing of fines is eliminated at the fertilizer application stage and no segregation of fines occurs, a desirable feature, for blended fertilizer producers desiring a completely homogeneous product that will not degrade or segregate.

Typical commercial operations range from about 2½ tph up to about 15 tph capacity, depending upon feed material, machine size, and operating variables. The equipment is currently used in compacting a variety of inorganic salts: potash, rock salt, sodium chloride, sodium nitrate, sodium nitrite, di-ammonium phosphate, ammonium sulphate and carbon.

Texas Gulf Offers Report on Sulphur in New Manual

Texas Gulf Sulphur Co., New York, last month issued a comprehensive, detailed *Sulphur Manual* that will be not only very interesting but extremely beneficial to companies now using or planning to use sulphur, solid or molten.

Because of the rapidly growing interest of the industry in getting supplies of sulphur in molten form, Texas Gulf has devoted two sections to this subject alone.

The Manual is divided into four sections, followed by an Appendix, with the following contents:

THE SULPHUR INDUSTRY. An up-to-date, comprehensive discussion of the sulphur industry on a world-wide basis.

SHIPPING OF MOLTEN SULPHUR. In this section, the company details its own experiences with molten sulphur and recommends certain procedures. With the trend in industry toward setting up central receipt and distribution points, this information will be of special value to companies planning such action.

HANDLING AND STORAGE OF MOLTEN SULPHUR. Here, the company gives detailed instructions on how to take care of molten sulphur shipments when they come in and how to set up both central and subsidiary storage facilities.

ANALYSIS OF SULPHUR. In this section, Texas Gulf details the latest analytical methods for checking the purity of sulphur; also best methods of sampling both solid and molten sulphur, and the most satisfactory analytical apparatus to use.

PHYSIO-CHEMICAL PROPERTIES OF SULPHUR. This part comprises a review of all the properties of sulphur, with the latest proved determinations.

Purposely, the manual has an over-size binder as the company is already working on additional sections which will be sent to those having copies of the manual. On request, Texas Gulf Sulphur Co., New York will send the manual and/or individual sections.

Uniformity in the

ON chemical analysis, the industry is fairly uniform due largely to the splendid efforts of the A.O.A.C. and the laboratories of the larger organizations in supplying analytical methods, which ascertain basic values. However, there is still the "bug-a-boo" of "Moisture." When moisture content is reported, there is some question as to whether the value given is really moisture or if the per centage also includes Crystal Water, and or other components volatilized in the determination environment. Fortunately, the advance of process techniques will force the development of more effective "Moisture Methods."

Free Acid Determination

Another point of non-uniformity chemically is "Free Acid." This value has been expressed in at least 3 categories: Phosphoric Acid, Sulphuric Acid and P_2O_5. Each proponent offers a seemingly valid reason; however, would it not be advisable to have all fertilizer investigators report the analysis in one specific category? Theoretically, the phosphoric acid connotation seems to be the most applicable. Research data covering recent work expresses the free acid value in terms of phosphoric acid. It might be kept in mind that other categories could be a supplementary notation.

In addition to the method of expression of values, several methods of extraction are used which should, and need to be defined. For absolute values of a relatively high degree of accuracy, Acetone should be used as the extractant. The use of water as an extractant is satisfactory, provided no attempt is made to relate the data so obtained with information from other sources.

fertilizer laboratory and plant

Particle Size Specification

The greatest confusion in the material data presented to the buyer is in the physical properties (particle size) specification. In presenting this type of data, no uniformity exists. And in many instances, the identification of standards used is entirely lacking. Hence, comparison of particle size claims of the many producers require the user to secure samples and make his own series of comparative tests.

In making a Particle Size Test, there are two important factors that should be standardized to remove some of the human element. Namely, (1) time of screening in Ro-Tap or similar standard equipment, and (2) size of sample, including how sample is taken from a large laboratory sample. (3) screen sizes to be included in the test.

In connection with "time of screening," several producers say ten (10) minutes for raw materials or powdered mixed goods suffice. For granular materials probably three (3) minutes would be adequate. Sample size may vary from 100 grams to 200 grams. This amount of sample should be taken from the large sample by riffling. However the test is made, it is most advisable that the size of sample and time of screening be identified in the data table caption.

The end use of the material or product predicates the amount and type of "Particle Size" information that is desirable. For this reason, fertilizer producers have introduced many screens to use in analysis. Because most Ro-Tap type screening devices will accommodate readily six (6) screens of eight-inch diameter, the selection and agreement on a 6 screen series for the most critical data would be most valuable.

A preliminary survey of screen test data at hand indicates that use of a Tyler series of Standard Screens 4, 10, 20, 28, 60 and 100 will give data that can be used to help in processing, or in the case of finished goods, indicate the field handling quality.

Undoubtedly, the screen selection will promote thought and discussion. Everyone probably has a prime interest in a particular particle size fraction for a specific purpose. For the sake of uniformity and simplicity, might one forego the need of odd fractions and give the Industry Particle Size Data which can be correlated from one producer to another?

Expression of your thoughts on the "Particle Size" subject is invited, for further evaluation of this question. It may be that a change in the screen would promote swifter industry-wide uniformity.

"Agricultural Chemicals" has been impressed by the enthusiastic cooperation of fertilizer production men,—and their unselfish interest in improving fertilizer technology. In the course of discussing fertilizer production operations with many plant men, however, we have been startled to find a complete lack of uniformity is largely due to the fact that progress has been so rapid in the fertilizer industry, that each plant superintendent and laboratory head—to meet an immediate need,—has devised his own system of accumulating and presenting data . . . tailored of course, to suit his individual operation. With so many other improvements in production techniques, until now there has been insufficient opportunity to exchange views, and adopt a uniform, general report system, so that data between plants in various parts of the country can be evaluated on a comparable basis.

"Agricultural Chemicals" hopes it can serve a useful function in this direction, by introducing the subject in this article,—commenting on data as now presented,—and inviting our readers to express their own thoughts on how specific data can best be reported. We hope to accumulate a series of suggestions and comments (and we hope YOU will write), for publication in an early issue. The compilation, of course, will simply let production and plant control superintendents know what their colleagues are doing. Adoption of a standard system of reporting data might then follow on a voluntary basis. Perhaps the mechanics of reaching agreement might involve appointment of a committee by the AAOC or the Fertilizer Industry Round Table.

Address your comments to:
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A few weeks after the NPFI cooperatives. Coops have argued

Fertilizer Dealers Meet

WASHINGTON REPORT

By Donald Lerch

WILL hens be forced by the Delaney Clause of the Food Additive Amendment to prove that eggs they produce won't cause cancer?

The question was raised by Rep. J. Arthur Younger, California, during a House Interstate and Foreign Commerce Subcommittee hearing on color additives to foods and lipsticks, after testimony disclosed that in one experiment feeding hard boiled eggs to mice caused cancer in some cases.

In the course of the hearing Dr. Thomas P. Carney, Vice President in charge of Research, Development and Control for Eli Lilly Co., testified that "if everything that has been made to cause cancer in laboratory animals were eliminated from use, life would be virtually impossible."

Among the 34 cancer causers cited, he said, were some foods, sunlight, and some clothing fabrics. These substances contain harmful chemicals, but in such minute quantities, that they are found to be safe for man. In fact, Dr. Carney said, there are many stronger cancer causing substances inside man than in any foods or sunlight, or clothing fabrics he may use.

The hearing brought the discussion of minute or trivial amounts of compounds in foods into the open. Industry leaders now feel this question of trivial amounts of residue is likely to become the most important issue to be decided if the new Food Additive Amendment is to be administered equitably and with justice to the best interests of all the American people.

More research to find pest control methods which leave no residues is on the schedule of USDA's Agricultural Research Service for coming fiscal year. Several months ago we reported a strong trend in ARS toward investigating such methods as male sterilization, greater use of attractants, chemicals that prevent larvae from maturing into adults, and biological agents.

Now this trend is confirmed by USDA's proposed budget for fiscal 1961 and the real extent of the trend can be seen. The proposed budget calls for a new item of $1,502,800 for developing chemical and biological pest control measures which will avoid residues in or on food.

Most of this money will be spent on research by ARS' Entomological Division, but small amounts will also go toward research in other divisions dealing with pest control.

USDA's research budget will be up in a number of other fields as well, making USDA one of the frontrunners in the drive for more research promised by government and industry for the 1960's. Utilization research, of interest to a number of private groups including the National Plant Food Institute and the Chemurgic Council, will get an extra $2,212,000 in fiscal 1961. This will bring the total to $18,442,600 a year for USDA's efforts to find more industrial uses for farm products.

States will get an increase, too. Total Federal payments to State Experiment Stations for research will total $32,803,708 in 1961, up $1,000,000 from 1960. The States usually put up three times the Federal payments in matching funds.

* * * * *

Everyone in Washington has reacted very favorably towards the upward moves of Dr. Russell Coleman and Paul Truitt, both formerly executive vice presidents of the National Plant Food Institute.

Dr. Coleman stepped up to the top spot as president of the newly-formed Sulphur Institute. The most frequent comment is: "They're both to be congratulated."

Interestingly, election of Dr. Coleman as president of the Sulphur Institute, and of Paul Truitt as president of NPFI, brings their careers around in a full circle. Both were association presidents in 1955 when NPFI was formed; Paul Truitt of the American Plant Food Council, and Russell Coleman of the National Fertilizer Association.

A NPFI spokesman reports that the change will not bring any immediate shift in NPFI programs or policies. The NPFI Board of Directors made it emphatic that they fully support the present program of increased promotion of fertilizer sales and wise protection of industry interests in the federal and state legislative fields.

J. D. Stewart, Jr., president of the Federal Chemical Company, who has been NPFI president, has moved up to vice chairman of NPFI's Board of Directors.

The Sulphur Institute is made up of five U. S. and three European sulfur producers. Its headquarters are located in a new building just across the street from the NPFI offices. Having strong European support, the Sulphur Institute will also have an office in London.

A few weeks after the NPFI released its new motion picture, "Bread From Stone," requests for showings reached such volume that available prints of the film already are booked well into May.

This overwhelming response confirms something we have been saying for years: both farmers and the public are intensely interested in the farmer's story. And this is exactly what "Bread From Stone" tells. Farmers are under attack today not because they have been lying down on the job, but because they've done too good a job.

The new 15-minute film is a major step toward telling the farmer's story to consumers and toward winning consumer appreciation that modern farmers deserve. We feel this is a film everyone involved in agriculture will want to see soon.

* * * * *

Businessmen appear to have a lot more work to do if they expect to gain passage of legislation to increase federal taxation of farmer cooperatives. The concensus here is that bills introduced to put Federal taxes on that part of a coop's earnings now exempt on the basis that it is paid to members or patrons will not be signed into law this session of Congress.

While they don't say so openly, few Congressmen and even fewer Senators are willing to alienate the nearly 8 million members of farmer cooperatives in a hot election year. Instead, the trend has been to seek the favor of farmers whose votes may determine which political party controls the White House and possibly the Senate in 1961.

Hard-headed political professionals speculate that with this kind of strong opposition, the best businessmen can expect this year is that the bill may get through the House but will fail in the Senate.

Business groups – particularly associations representing small businessmen–have argued for the measure to bring tax equality and improve their position vis-avis cooperatives. Coops have argued against the measure on the grounds that it would be double taxation of the earnings of farmer cooperatives, once when the cooperative earns it and again when the farmer member or patron receives it.

* * * * *

Recognizing the growing importance of getting the story of pesticides' benefits to the key influence groups and to the public, the National Agricultural Chemicals Association is stepping up its public relations program.

Both NAC's fact book, "Open Door to Plenty" and its slide program "Pesticides – Boon to Mankind," are being given steadily wider distribution. Some 70,000 copies of the fact book already have been distributed to the press, radio, and TV editors, county agents, vo-ag teachers, and the nation's science teachers. More than 3,000 showings of the slide program are scheduled for this spring.

NAC's annual radio series, featuring such national leaders as Charles Shuman, President, American Farm Bureau Federation, and Herschel Newsom, Master of The National Grange, are now going out to some 500 radio stations coast to coast.

Heads of both major farm organizations are urging citizens to use pesticides properly to improve farm production efficiency and are urging Government agencies to administer laws regulating pesticides with common sense.

Other outstanding speakers on the NAC radio series will include Dr. Byron Show, Director, Agricultural Research Service; Dr. M. W. Parker, Director, ARS' Crops Research Division; Dr. Clarence Hoffman, Assistant Director, ARS' Entomological Division; Dr. George McNew, Managing Director, Boyce-Thompson Institute; Alan Raines, Executive Vice President, United Fresh Fruit and Vegetable Association; and Maynard Coe, Director, Farm Division, National Safety Council.★★

Fertilizer Dealers Meet

A THREE-COUNTY Fertilizer Dealer-Salesmen meeting was held Feb. 5 in Batesburg, S. C. Representatives of Edgefield, Lexington, and Saluda counties attended the meeting.

Frank Boyd, president of the Alabama Soil Fertility Society, discussed the importance of soil testing. He said that only through soil testing and the following of lime and fertilizer recommendations, along with other sound management practices, can the farmers of South Carolina, or any other southern state, raise farm profits.

The problems that farmers of the area must overcome to improve profits were outlined by W. H. Craven, Saluda County Agent. High on the list of problems cited by Mr. Craven were high soil acidity, low soil fertility, low crop yields, low plant populations, and inadequate moisture.

O. W. Lloyd, Edgefield County Agent, told how a good soil fertility program, properly planned and executed, can help farmers cope with their production problems. The role of the extension specialist and county agent in pushing a soil fertility program was discussed by M. A. Bauknight, Lexington County Agent, who said that extension specialists can organize the program and take the soil samples.

The responsibility of the fertilizer industry was outlined by J. H. Epting, Epting Distributing Co., Leesville, S. C., He said that, to meet the challenge of a rapidly changing agriculture, the industry must: support more closely the agronomy programs of the extension service and the experiment stations; do a better job of promoting fertilizer; render a better job of customer service; and improve the merchandising arrangement, including dealer distribution systems.

Let's face it, Mr. Epting said, the fertilizer industry is the weak link in the chain of getting information put into practice on South Carolina farms.

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The AGRICULTURAL Applicator

- Safe Handling of Pesticides
- Illinois Spray School
- CAAA Convention

Ted Venegas, general manager of T. F. McLoughlin Crop Dusters, Oxnard, Calif., is shown applying granules to a lemon orchard near Carpenteria, Calif. An unusually good view of orchard work, the photo was provided by Transland Aircraft, manufacturers of the Sellers Swathmaster. See page 70 for other details.

Left to right: Steve Moore, extension entomologist; A. F. Beckenholdt, Mansfield, Ill.; Howard Bryson, Lake Fork, Ill.; and Al Renschen, Breese, Ill.

Granular Herbicide Use Up Illinois Applicators Are Told

by Patricia A. Close
Editorial Writer, University of Illinois

A CAPACITY audience at the Illinois Custom Spray Operators' Training School heard that spray applicators used far more granular chemicals for pre-emergence weed control in 1959 than was expected.

"These chemicals gave satisfactory weed control with little crop damage," continued W. G. Lovely, an agricultural engineer stationed at the Ankeny, Iowa, U. S. D. A. station. He feels that the use of granular chemicals will increase this year. He cited their success last year and said that chemical and equipment manufacturers will push sales of granules in 1960.

The 12th annual Custom Spray School met January 27-28 at the University of Illinois in Urbana. The 750 persons attending included aerial and ground spray applicators, chemical and equipment manufacturers and salesmen, farm advisers and farmers.

In addition to Mr. Lovely's talk on granular and liquid herbicides, several other reports included: (1) a discussion of granular application equipment, (2) a report on new weed control chemicals, (3) 1959 results with pre-emergence weed control, and (4) the 1960 insect outlook.

In discussing granular chemicals, Mr. Lovely gave several reasons why they are becoming more popular than liquid chemicals. He believes their ability to fit the farmer's planting operation better than sprays probably rates as the No. 1 reason. A farmer already handles bags of weed and fertilizer, so it's less trouble to handle more bags of herbicides than liquid herbicides.

Mr. Lovely listed the following as major advantages of granules: (1) no water to handle, (2) no mixing required, (3) no sprayer problem, (4) less total weight, (5) less drift, and (6) less irritation.

Granules require, however, new equipment, more storage space and more handling than sprays. They are also more expensive and less effective for foliage application than sprays.

Mr. Lovely announced results of Iowa field studies that tested granular herbicides for controlling weeds in field corn.

Results showed that applications of 2,4-D, Randox, Simazine and Eptam granules controlled weeds about as well as sprays did. Researchers applied both granules and sprays as pre-emergence applications. Sprays of 2,4-D sometimes had slightly more effect than granules at application rates below 2 pounds an acre. And crop damage sometimes occurred at the 4 pound per acre rate with both sprays and granules, he said.

Mr. Lovely also reported that the working of granules into the soil did not improve their effectiveness except in the case of highly volatile chemical, such as Eptam. Tests with 2,4-D, Randox and Simazine showed no advantage for soil incorporation.

The agricultural engineer also discussed equipment for applying granular herbicides. He believes that at least three equipment manufacturers will sell planter attachments for applying this material

H. B. Petty (right), chairman of the Illinois Custom Spray Operators Training School, chats with: (left to right) Walter Budzyuski, Chipman Chemical Co., Florissant, Mo.; Robert Hall, St. Charles, Illinois; Howard McCoy, Seward, Illinois; and H. F. Seifert, Illinois Department of Agriculture, Springfield.

Part II

Part I of this report begins on page 61 in the February issue.

in 1960. Although the U. S. D. A. has not tested these units, Mr. Lovely feels they will do an adequate job of metering and spraying granular herbicides.

Several corn borer tests have shown little difference among metering devices as measured by the control they gave. Augers, fluted wheels and shafts, reciprocating chains and ropes, gravity feeds with and without agitators, and crop dusters successfully metered out granular materials.

Studies with insecticides also revealed that aircraft applications of granular chemicals are possible *if* an overdose of weed killing chemical will not injure the crop.

Mr Lovely emphasized that proper care and calibration of application equipment are essential for granular herbicides to get good results. He stressed the importance of buying chemicals and equipment from reputable dealers and following state experiment station recommendations.

Illinois Applicators Elect

Members of the Illinois Aerial Applicators' Association climaxed their annual meeting January 26 by electing new officers for 1960.

Re-elected as president was Bob Danforth from Monmouth. Richard E. Ritenour, Polo, was elected as vice-president, and Merle Stinnet, Litchfield, will serve as secretary-treasurer. Mr. Stinnet served as vice-president this past year.

As part of their business discussion, the group considered the possibility of producing an educational film on aerial applications. They are making further investigations before definitely deciding whether to do so.

The group met in Urbana preceding the Illinois Custom Spray Operators' Training School.

Insect Outlook for 1960

Weather conditions favorable to corn borers in Illinois could lead to moderate amounts of damage by first generation borers. "This is the first time in several years that this possibility exists," H. B. Petty told the audience. Mr. Petty based his forecast on a second generation corn borer survey made last fall.

He explained that weather conditions favorable to corn borers include: (1) cool weather until corn is planted, (2) a mild summer, (3) good moisture, and (4) absence of violent storms during moth flight.

Turning to spittlebugs, Mr. Petty said Illinois' adult population of this insect was not as high last fall as in the previous two years (1957 and 1958). But it's still high enough to supply plenty of spittlebugs in Illinois this spring.

Unless farmers use soil insecticides before planting, Mr. Petty warned, grape colapsis may seriously damage corn or soybeans that follow red clover or second-year beans. This possibility exists in a band from St. Louis to Quincy, Ill.

To control spittlebugs by cultural methods, Mr. Petty suggested plowing red clover ground early, disking frequently to stifle weeds, delaying planting, and using fertilizers with high levels of phosphate.

As for grasshoppers, Mr. Petty stated there are only a few Illinois areas where they may cause trouble. This includes the northern half of Woodford county, most of Marshall county, and the southern half of Putnam county. In the southeast, Wabash, Edwards and Lawrence

(Continued on Page 117)

Left. Two training school speakers, C. Boyd Shaffer ,left) and Fred W. Slift (second from right), discuss their reports with Ray Lebeck (second from left), Harvel, Ill., and Curtis Harrison (right), Norris Farms, Havana, Illinois. Shaffer is with the American Cyanamid Company and Slife is a University of Illinois agronomist. **Right.** F. G. Anderson (left), Illinois Department of Agriculture, talks with: (left to right) R. W. Luhtenberger, Ellery, Ill., Vernon Anderson, Newark, Ill., and Kenneth Caldwell, Creston, Iowa. The two-day school met January 27-28 in Urbana.

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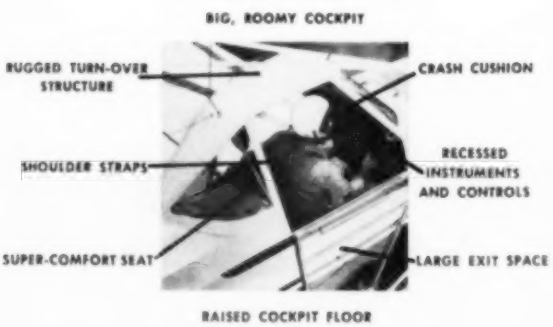

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The Safe Handling Of Pesticides

Toxicity Hazards Call For Increased Care During All Stages of Pesticide Handling, Plus Protection Features On Equipment

by Robert Z. Rollins
Chief, Bureau of Chemistry
California Department of Agriculture

PESTICIDES can cause trouble in many ways before, during, and even after, application. The hazards involved during the manufacture and packaging of these materials can be anticipated and appropriate precautions taken comparatively readily. Manufacturing plants operate with a relatively permanent and well-instructed staff and it is common practice for firms handling hazardous pesticides to schedule regular medical supervision over employees. The manufacturing industry is well aware that accidents are expensive, and, therefore, pesticides cause relatively few accidents at this stage of their preparation and development.

Pesticides present some hazards during transportation. For example, there have been cases recently where bags of parathion dust have fallen off trucks in transit and caused widespread alarm in the locality. Several bags fell off a truck and broke on a freeway in Oakland, Calif., and the freeway had to be closed for more than an hour while a special decontamination crew was called to remove the spilled powder. In another case, a bag fell off a truck in front of an open hot-dog stand and the dust whipped up by passing cars affected several people and caused a scare.

Hazards to health may occur during storage if sufficient care is not exercised. Most of the ten to twelve deaths attributed to pesticides in California each year occur to small children less than five years old who play with or drink some pesticide they have discovered, often as a result of careless storage.

The hazards that pesticides present in storage have been of particular concern to firemen's associations in recent years as a result of several cases where firemen have been severely injured while fighting fires in warehouses, barns, and similar structures in which highly toxic pesticides have been stored.

Several municipalities are reported to be studying the hazards presented by such pesticides with the view that an ordinance might be drafted outlining the precautions that should be taken in order to avoid accidents in the storage of these materials within city limits.

During application, of course, pesticides present a serious hazard to workers during loading operations and, also, the operators of application equipment. Drift can be dangerous if it comes in contact with neighboring crops or livestock, and serious repercussions can follow when the drift imparts a persistent residue on a nearby food or feed crop about ready for harvest.

Emptied containers of pesticides present a very important hazard and some deaths have been caused by them. The re-use for packaging food or feed crops of bags that have been impregnated with a highly toxic organic phosphate or organic mercury compound has been a problem during the past season.

Residues of organic phosphates on trees and other plants present a definite threat to pickers, pruners, or thinners. Some cases of mass poisoning of whole crews of workers have resulted from exposure to such residues. Operators of tractors in heavily planted orchards and even irrigators working in low-growing crops, such as onions, have been affected by residues of parathion on these crops.

Perhaps knowing how agricultural chemicals cause injury, designers of farm machinery will be better able to take corrective measures in design. For example, it would be well to do something that would minimize exposure of workmen to pesticides during the filling of spray tanks and the mixing of ingredients. Possibly some kind of closed system might be developed so the package of pesticide could be added to the tank and mixed, and the container rinsed, with a minimum of handling.

Certainly designers of farm machinery intended for application of pesticides should take particular caution to avoid leakage where the material might affect the operator from fumes, dust, or liquid. Some accidents that we have investigated have been caused when a small leak in the equipment resulted in contaminating the body of the workman with a dangerous amount of the spray or dust he was applying. Many of the

(*Continued on Page* 119)

During our past spray season we operated three different types of new agricultural aircraft. Without a doubt the Ag-Cat hauls a bigger load with much more safety than the other two; and made us more money than any agricultural airplane we have ever owned. 1,500 lbs. in the Ag-Cat is a breeze!

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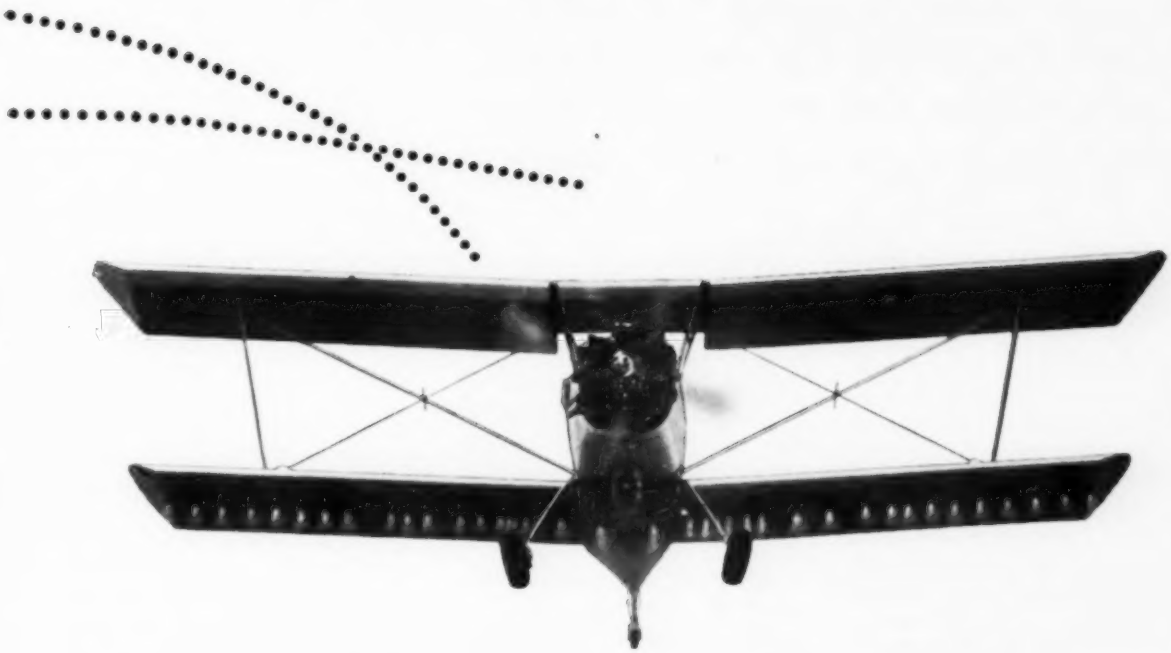
Mr. Jack Ferdinand of J & J Cropdusters, Bakersfield, California

Our work consists mostly of dusting apple orchards and blueberries; mouse baiting orchards; spraying row crops and mosquito work. The Ag-Cat has given us 41% more acres per hour using 52% less fuel.

Mr. Alden E. Robinson of Aero Spray and Dust Service, Accord, New York



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Drift Sampling Method Told CAAA

Prompt Sampling of Contaminated Fields Can Determine Safe Harvesting Periods. Also Discussed Are Safety and Publicity

by Edward J. Meier

PART II*

MOST of the money paid in damage claims in California is because of drift trouble, said Robert Z. Rollins, chief of the Bureau of Chemistry, Sacramento.

The most serious problem now is contamination of milk. The cow is a very efficient mechanism for the concentration of chlorinated hydrocarbons, he said. Why worry about milk? Because milk provides one quarter of the entire U.S. diet, Mr. Rollins said. He warned that seizures of contaminated milk are on the way and in the very near future. He presented a bleak outlook for solution of this problem. Presently, the FDA doesn't allow even a trace of contaminant in milk, whereas several parts per million are tolerated in lettuce. The real problem is contamination of forage and pasture. Another problem is that hay is not readily identified. Business can't keep baled hay separate.

To give an idea of the extent of drift, the speaker said that in a three mile an hour wind, a one micron dust particle can drift 84 miles. Much of the dust used is of this size. Spray is safer if the particle size is coarse. The particle size is a criterion of the extent of drift. Painting a rather unencouraging picture of more and more difficulties with milk and the dairy industry on contamination, the speaker offered only the possibility that operators consider expanding their services by adding ground equipment to handle the more touchy jobs, such as next to forage acreage.

Following the discussion of the serious effects of drift, by Robert Rollins, Dr. R. V. Fogleman, Hazleton Laboratories, Inc., gave applicators some suggestions on attacking this growing problem.

"Let us assume that a surprise crosswind comes up during an application and you pull up just in time to see your spray move over into the next field. Of course, it depends on what pesticide you are applying and what the contaminated crop is, but generally you can anticipate the over-all condition as being the worst possible.

Here is what I think you should do about it:

After 24 hours, take samples and analyze chemically to determine the level of contamination. The reason for waiting 24 hours, is because the initial degradation of a residue may take that long to stabilize. A second sample series should be taken a few days later to determine the rate of disappearance of the pesticide on the crop. Only then do you have a basis for estimating when the crop can be safely harvested.

You will need some experienced guidance to help you interpret these facts, and in some cases even that kind of help will be inadequate because not enough data are available. In those cases, additional analyses will be needed to provide the facts.

The sampling of the contaminated field is of prime importance in finding out the extent of contamination. The first series of samples should provide two sets of facts: (1) the level of contamination; and (2) the extent of contamination across the field.

To do this, the sampling must be done at right angles to the swath made by the plane, as well as parallel to that swath.

The sampling procedure is very important. If the sample is not representative of the field, the result of the analysis will be worthless. These are the main points to keep in mind:

(1). The sample area should not be too large, certainly not over four acres. A strip 10 feet wide and 100 feet long may be adequate for a single sample. These strips should be laid out in advance of sampling, and marked or flagged. The actual positioning of these strips depends on many factors, but they should be set so that the analytical results will give a clear picture of "How much" and "Where."

(2). In each strip selected, choose the sample over the entire area. Pick the medium-sized examples, not the largest. Collect about four to six pounds from each strip.

(3). Put the sample from each strip into a polyethylene freezer bag; identify it carefully. Cool immediately in a freezer or with dry ice. When all samples are tagged, ship with dry ice to the laboratory for analysis.

(4). Be sure that you do not trim any of the sample, or wash it to remove dirt. Let the laboratory do that if necessary. Washing only removes residues and will give a false picture.

(5). When you know the results of the analyses, you know the extent of the damage. A sec-

*Part I of this report starts on page 65 in the Feb. issue.

ond sample taken a few days later, if necessary, will give an estimate of when the field will be safe to harvest. This second sampling depends on the pesticide and its tolerance, as well as other factors, such as crop maturity, crop value, and whether trimming or washing or other processing will be expected to remove excess residues.

The analysis is a very important part of this program. This is the basis for applying the numerical values to the problem. You should select a laboratory which is equipped to handle residue samples, and knows the analytical technique involved. Wherever possible, the analytical methods should be specific for the pesticide. For example, the organic chloride pesticides may be analyzed for by measuring the chlorine present. If you applied DDT and the field had been treated with Kelthane, for example, the result would be meaningless because both types of molecules would be measured. Specific methods require more time to run, but in this kind of a situation, a false answer is worse than no answer at all.

The method must also be a residue method, as distinguished from a quality control type of method. For residues, elaborate clean-up procedures are required to remove any material which might interfere in the analysis without losing the pesticide. Also, we are talking about very small total quantities of pesticide; on a four pound sample, about two mg. total pesticide is present if the residue is one ppm. This is two- thousandths of a gram or one 32-thousandths of an ounce. In residue chemistry, this is a large quantity of pesticide.

About the most that can be said for this important part of the investigation is to select the laboratory as carefully as the sample.

When the results are all collected, the interpretation must be made, based on residues, toxicology, tolerance levels, and other factors. Some of you may be in a position to perform your own evaluation; if not, competent experts are available to assist in the interpretation. This is the stage where you learn just where you stand and what can be done about it.

In summary, when drift occurs, sample the field, have the samples analyzed, and get a good interpretation of the data.

Don't Sell The Farmer Short

John Neace, Neace Aviation, Litchfield Park, Arizona told CAAA members that applicators have their own problems, such as pilot replacement—but every problem the farmer faces, also is the ap-applicator's problem.

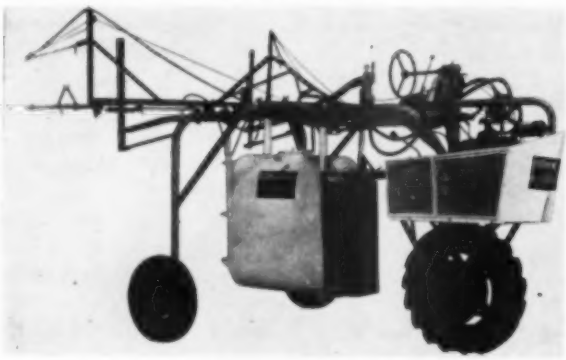
"For instance, it is the fad among some of the leading publications in this nation to take pot shots at the farm subsidy program. Subsidy is like a bathtub running full of water; fine until it runs

(*Continued on Page* 114)

agricultural applicator

Low-Priced Hi-Boy Sprayer Added To Hahn Line

A low-priced Hahn Hi-Boy has been added to the line of high-clearance sprayers offered by Hahn, Inc., Evansville, Ind. The new machine is priced at about $1,000 less than the firm's deluxe models and is said to have many of the same features. The boom height is adjustable from the driver's seat to from 1 to 12 feet.



Mississippi Applicators Meet

The Mississippi Aerial Applicators Association's 1960 conference was held at the Buena Vista Hotel in Biloxi, Miss., Feb. 12 and 13 Three representative of the Federal Aviation Industry were on hand to discuss regulations and trends in aerial application.

Jay A. McCausland, FAA, Washington, D.C., discussed proposed FAA regulations that will concern applicators; Joseph J. Werbke, FAA, Fort Worth, Texas, talked of trends in aerial application business volume; and Frank Wignall, FAA General Safety Office, Jackson, Miss., told of the trend of aerial application accidents. Proposed state legislation concerning aerial applicators was discussed by C. A. Moore, director of the Mississippi State Aeronautics Commission, Jackson.

K. P. Ewing, retired USDA entomologist, reported on new business opportunities. Glen Galtere, Magnolia Aviation Co., Laurel, Miss., outlined the pilot's responsibility and obligation to the customer; and Battle Ewing, a Tunica, Miss., farmer, told the conference what the customer expects of the applicator.

The trend in USDA application contracts in the south was reviewed by L. J. Padget, USDA Plant Pest Control Division, Gulfport, Miss. Other speakers included: A. G. Bennett, Mississippi State University; S. L. Calhoun, Billups Plantation, Heathman, Miss.; B. F. Smith, Delta Council, Stoneville, Miss.; and Lloyd Nolen, NATA vice president, agriculture. A complete report on the meeting of the Mississippi Aerial Applicators Conference will follow in the April *Agricultural Chemicals*.

•

Gandy Offers New Models

The Gandy Co., Owatonna, Minn., has added nine new models to its line of granular chemical applicators for soil insect and weed control. The company now offers 12 models.

Among the features of the Gandy line are: improved rate-control metering mechanisms; weather-tight hoppers; heavy duty braces and mounting brackets; and a drive sprocket that is adaptable to a wide variety of drive shaft sizes. All models may be used singly for either weed or insect control, or can be tandem mounted to do both jobs at the same time.

•

Weed Control In Turkey

Crop protection from the air in Turkey totalled 567,600 acres in 1959. The season lasts from about March 15 to June 30.

•

Spray Compatibility Chart

The *American Fruit Grower*, Willoughby, Ohio, is offering revised editions of its Compatibility and Spray Safety charts. On orders of 100 or more copies, the ordering company's name and address will be imprinted on the charts at no added cost.

Ninth Agricultural Aviation Conference Held Feb. 21

THE ninth Texas Agricultural Aviation Conference and Short Course on Pest Control was held Feb. 21 to 23 at Texas A&M College, College Station, Texas. Wayne G. McCully, Texas Agricultural Experiment Station, College Station, was chairman.

A feature of the meeting was a panel report by Texas A&M authorities of current recommendations and progress in the aerial application of agricultural chemicals. Dr. A. G. Caldwell, department of agronomy, discussed foliar nutrition; Dr. J. C. Gaines, department of entomology, covered insecticides; Dr. R. A. Darrow, department of range and forestry, spoke on herbicides; and Dr. Wayne C. Hall, department of plant physiology and pathology, reported on defoliants and desiccants.

The responsibilities of the aerial contractor under the Miller Bill were discussed by a panel comprised of Reo E. Duggan, chief chemist, FDA, New Orleans; Dr. Clarence Cottam, Welder Wildlife Refuge, Sinton, Texas; and Stuart W. Turner, consulting agrologist, San Francisco, Calif.

Among other speakers at the conference were: Arnold Kretzinger, *The Progressive Farmer*, Dallas, who spoke to the applicators about the sale of their services; Don Springer, agricultural meteorologist, Weather Bureau, Washington, D. C., who discussed weather forecasting for agricultural operations; and Harry B. Nunn Jr., U. S. Department of Labor, San Antonio, Texas, who advised applicators about the status of their labor problems.

A third panel discussion covered the outlook for aerial application in agriculture. Dr. John G. McHaney, agricultural economist, Texas A&M; Dr. J. H. Davidson, Dow Chemical Co., Midland, Mich., and Louis A. Liljedahl, agricultural engineer, USDA, Beltsville, Md., were on the panel.

PEST ROUNDUP

By Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U.S.

Increased Early Insect Detection Bearing Fruit

ALTHOUGH the importance of early detection of insects new to the United States or introduced established pests new to another area has long been recognized, it appears that the increased emphasis on insect detection is bearing fruit. Early detection of insects new to an area has always been one of the objectives of the cooperative economic insect survey. Recent development of better materials and methods of application, together with the success of the second Mediterranean fruit fly campaign, however, stimulated greater interest. Accordingly, in 1957, entomologists and related agricultural workers asked for a stepped-up detection effort. The accelerated program was initiated formally in 1959.

At that time there were new records on 10 insects not previously known to be in the United States as compared with 2 new insects recorded in 1958. There were over 70 new state records in 1959 for insects previously known to be in this country compared with 26 new state records in 1958. This does not necessarily mean that 1959 was the first year that the insects may have been in the area, but it was the first year such occurrence was reported.

Although none of the insects reported for the first time in the United States were considered to be of the magnitude of the Mediterranean fruit fly or khapra beetle; nevertheless, some are potential economic pests. A Cuban May beetle (*Phyllophaga bruneri*) was collected in a four mile area of Miami, Florida, in June 1959. In Cuba, the beetle is known only from the area around Santiago de las Vegas where it appears to be a rare species. Adult beetles feed primarily on foliage of broad-leaf trees and shrubs, but occasionally damage flowers. The larvae of the beetle damage roots of grasses and it is suspected that the host list might be fairly wide with thorough study. Preliminary studies in Miami found the adults to be feeding on 16 different species of plants.

The pumpkin caterpillar (*Diaphania indica*) was reported from Florida in November, 1959 from collections as early as 1955 but identification was not confirmed until last year. Subsequent reviews of specimens show the insect to have been collected in Florida as early as 1946 as well as in South America and the West Indies. This insect is an important pest of cucurbits wherever it occurs in the Old World, and in the Indian region it is one of the outstanding pests of these crops.

A thrips (*Haplothrips clarisetis*) was reported from California in March, 1959. Later, this species caused severe damage to lettuce plantings in New Mexico. A pyralid (*Aglossa pinguinalis*), a potential stored grain pest, was reported from Massachusetts in August, 1959 although it was first collected in the State in 1949. An olethreutid moth (*Iaspeyresia fletcherana*), which infests bark of Douglas-fir, was reported from Montana in May.

Other first U. S. records for 1959 included an ant (*Prionopelta* sp.), a wood-boring bostrichid (*Sinoxylon conigerum*) and a rice root aphid (*Tetraneura hirsuta*) all from Florida, a talydid (*Maconema thalassimna*) from New York and a beneficial insect, a wax moth parasite (*Apanteles galleriae*), from North Carolina.

Among the insects previously known to be in the United States, the face fly (*Musca autumnalis*) apparently made the most spectacular spread in 1959. This insect, which bothers livestock, was first found in this country in New York in 1953, but not until last season was it considered to be of significant economic importance. During 1959 the following states reported the insect for the first time: Virginia, Ohio, Indiana, Illinois, Pennsylvania, Wisconsin, Michigan, Massachusetts, New Hampshire, Delaware, New Jersey, West Virginia, and Vermont. The alfalfa weevil which was first found in the eastern United States in 1952 in Maryland, and has since rapidly spread in the eastern states, was found in Alabama, Kentucky, and Tennesseee last season.

Among other important first state records on insect finds are the white-fringed beetle in Arkansas, the rice weevil in California, the European corn borer in Texas, the khapra beetle also in Texas, the European pine shoot moth in Washington, and the southeastern corn borer in Mississippi.

Insect activity was at a rather low ebb during January. Green-

(*Continued on Page* 111)

Florida Horticultural Spraymen Install Officers

New officers installed at the Jan. 16 banquet of the Horticultural Spraymen's Association of Florida are: (left to right) William McAllister, Miami Lawns, president; John Page, Busy Bee Exterminators, vice president; Tom Hammil, Bow Arrow Gardens, treasurer; and Richard Zaun, Zaun's Spray Service, secretary.

Granules Applied To Orchard

Photo on page 59, taken on the Knapp-Atkinson Ranch, Carpenteria, Calif., shows a lemon grove being treated with a granular material, 5 per cent Chlordane at 50 pounds per acre, for ant control. The plane is equipped with a Swathmaster.

Author's Views Misquoted

Dr. F. E. Webb, author of the article "Aerial Forest Spraying in Canada" in the November, 1959, issue of *Agricultural Chemicals* has pointed out to the editors that the editorial insert on page 64 is not a faithful quotation from his article and may misrepresent his views to the casual reader. We suggest, therefore, that readers interested in the important and contentious question of adverse effects of large-scale forest spraying operations should take their interpretation of his article from his own words, in particular the section entitled "Adverse Effects" on pages 111 and 112.

Approve Larger Ag-Cat Engine

French Aviation Co., Bakersfield, Calif., a Grumman distributor, has received supplementary certificates from the Federal Aviation Agency covering the installation of 300 and 450 HP engines for the Grumman Ag-Cat.

The Ag-Cat was certified for 300 HP Lycoming and 450 HP Pratt & Whitney engines. It normally is powered by a 220 HP Continental engine. The installation of higher horsepower engines enables the aircraft to carry chemical dispersing equipment such as engine-driven pumps and the Seller's Swathmaster.

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Kansas Aerial Appl. Meet

William Rucker, Burdett, Kans., was reelected president of the Kansas Aerial Applicators Association at its third annual meeting held February 13 at the Warren Hotel, Garden City, Kans. Other officers include, vice president, J. F. Hardesty, Ashland, Kans.; secretary-treasurer, Mrs. W. Rucker.

Some 40 members and guests from Kansas, Texas and Colorado attended the sessions. Members are current licensed spray operators in the state of Kansas.

Among the discussions, were a report on "Weed Control Problems," presented by P. Marvin, entomologist for the Robert Wise Co., Wichita; a review of recent insect problems by L. DePew, entomologist, Garden City, Kans.; a report on maintenance problems on spray equipment and aircraft by Dale Simpson, Simpson & Whitney.

Keith Boyd, Wichita Fertilizer Co., reported on "Fertilizer facts," while B. L. Hinman, Bee's Airline, Plains, Kans., outlined some of the advantages of aerial application of fertilizer, as well as related problems.

In a demonstration of aircraft performance, B. L. Hinman flew the Piper Pawnee, while Leland Snow of Snow Aeronautical Co., Olney, Tex., demonstrated the Snow aircraft.

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Delavan Appoints Castano

Delavan Manufacturing Co., West Des Moines, Iowa, has appointed Marco T. Castano of Lemarco Agricultural Spraying and Machinery Co., New Orleans, as its manufacturer's representative in Central and South America.

Arcadian® News

Volume 5 | For Manufacturers of Mixed Fertilizers | Number 3

Are You Taking Full Advantage of Nitrogen Division Service?

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To provide its customers with competent, well-qualified technical assistance, Nitrogen Division maintains the largest, best-trained, most-experienced staff of fertilizer technologists in the industry. This staff includes hundreds of fertilizer technicians, scientists and engineers working with millions of dollars worth of laboratory and pilot plant equipment.

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Long-time leading producer of fertilizer nitrogen, Nitrogen Division owns and operates three huge plants—at Hopewell, Virginia; South Point, Ohio; and Omaha, Nebraska—by far the biggest nitrogen production capacity in the country. And, Nitrogen Division offers the most complete line of nitrogen products available to the fertilizer manufacturer.

Look over the list of ARCADIAN® Nitrogen Solutions and other ARCADIAN Nitrogen Products on page 4 of this issue of ARCADIAN NEWS. No other nitrogen producer is so well prepared to supply your complete nitrogen needs. You can get the exact nitrogen products you want from Nitrogen Division—and *all* your nitrogen from one source.

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Getting your order to you on time for you to meet production schedules is standard procedure for Nitrogen Division. Its three plants are strategically located for fast shipment to fertilizer manufacturers, with the aid of the largest fleet of tank cars in the industry plus many tank trucks. A widespread network of "in-transit" storage points is maintained, where fully-loaded tank cars sit on railroad sidings ready to move immediately for fast deliveries.

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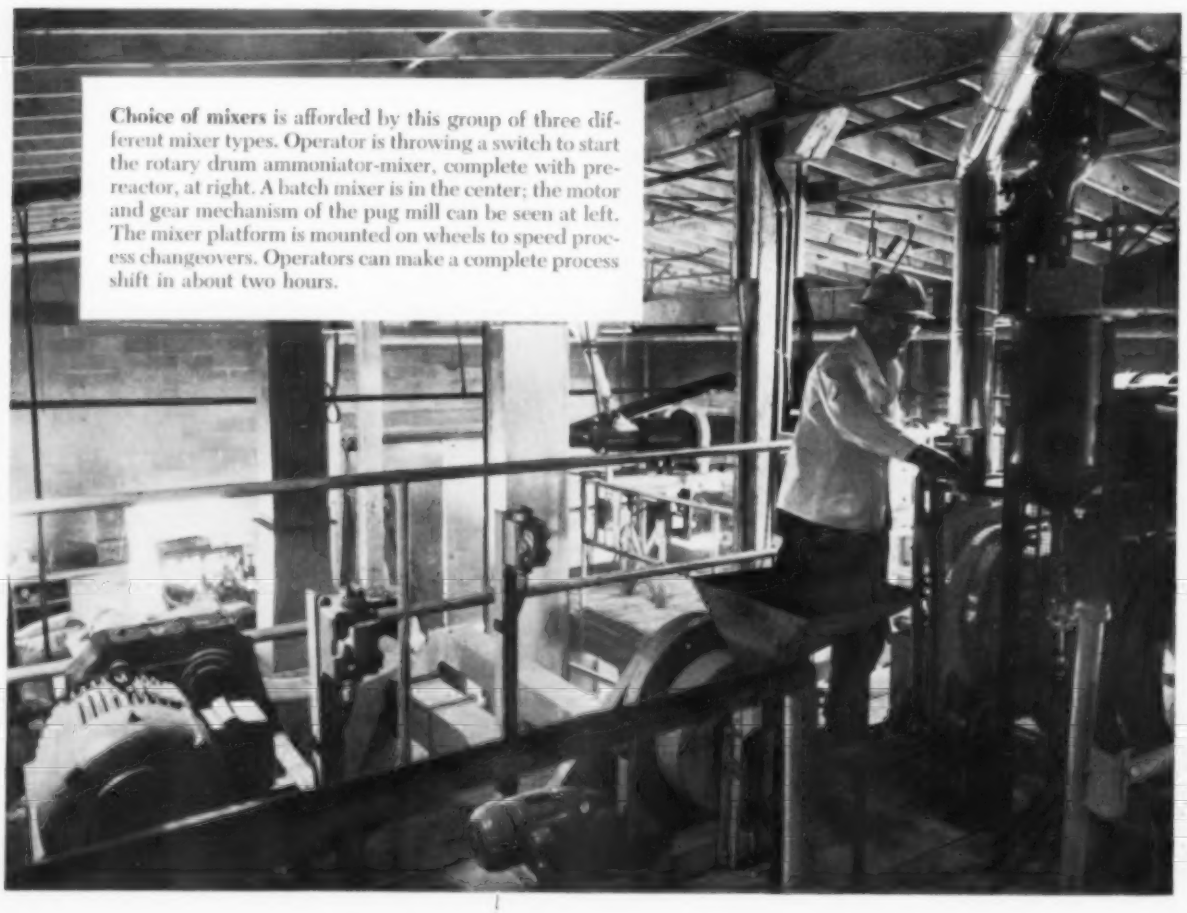
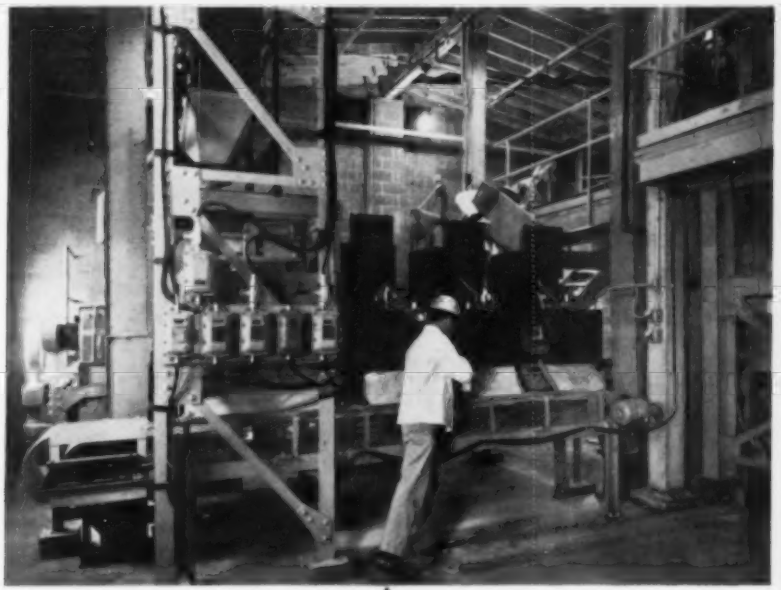
This highly flexible pilot plant facility, coupled with the wealth of experience and high competence of Nitrogen Division chemical engineers, chemists and technicians makes the famous Nitrogen Division Technical Service more valuable than ever to fertilizer producers. For complete details—without obligation—write to Technical Service, Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y.

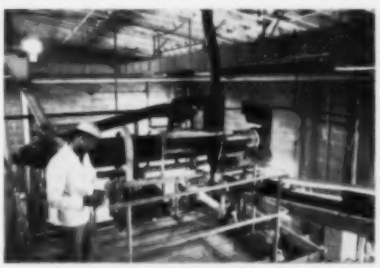


Choice of mixers is afforded by this group of three different mixer types. Operator is throwing a switch to start the rotary drum ammoniator-mixer, complete with pre-reactor, at right. A batch mixer is in the center; the motor and gear mechanism of the pug mill can be seen at left. The mixer platform is mounted on wheels to speed process changeovers. Operators can make a complete process shift in about two hours.



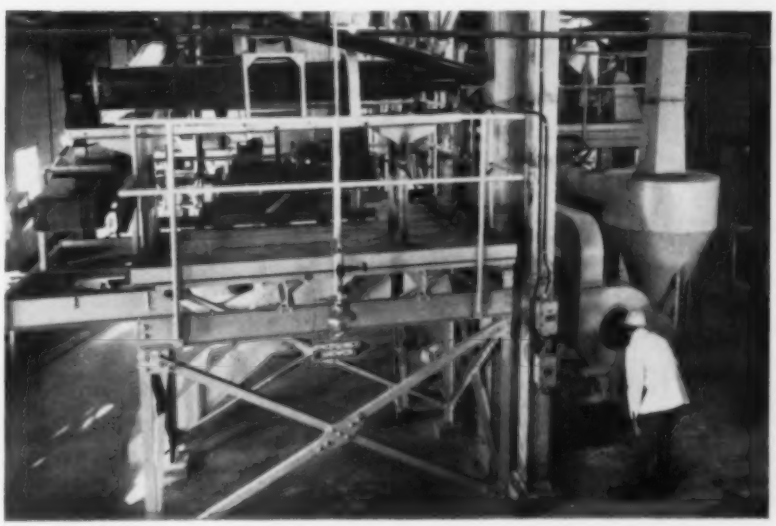
Continuous mixed fertilizer production begins here, at the solid feeder station. Man above is loading superphosphate into a measuring bin, as man below takes a weight sample for checking. Solid materials feed from measuring bins downward to a moving belt that goes off at right to the mixer. The sloping hopper, at top left, contains screens that separate fines, on-size and coarse granules. On-size goes to bagged or bulk storage; coarse proceeds to the crusher, and then recycles to the screens; fines go directly to the moving belt for recycling to the mixer.

Liquid feeder station gives convenient centralized control over the flow of various liquids—water, nitrogen solution, acid—to the pre-reactor and mixer.



Operator checks a sample for temperature before mix enters the cooler through duct at left. Mix travels through cooler to output end at right, losing about 50 degrees of heat before it drops to a moving belt climbing to the screens.

View of processing area shows mixer platform structure at left. Extra granulator for optional use is directly beneath rotary ammoniator-mixer. Note wheels and floor tracks that make the mixer structure easy to move for process changes.



Overall view shows compact design of pilot plant. Technician in foreground is peering into dryer. Funnel shaped equipment next to dryer is the dust collector. Above and behind this is the mixer platform, where a man is checking the pug mill. The long, cylindrical object just above center is the cooler, next stop for the mix after it leaves the dryer. The top of the solid feeder station can be seen in the area beneath the cooler.

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	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
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2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

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LISTENING POST

By Paul Miller

Correct Use Of Karathane, Sulfur Controls Powdery Mildew

L. E. Dickens and W. J. Henderson, of Colorado State University, observed that in 1958 apple powdery mildew, caused by the fungus *Podosphaera leucotricha*, was very severe in some apple-growing regions in Colorado, especially in Delta County. Orchardists reported that control obtained with Karathane and micronized wettable sulfur, the standard recommended fungicides, varied from excellent in some orchards to unsatisfactory in others.

In 1959, to demonstrate the use of these chemicals for powdery mildew control and to provide additional tests of their relative efficiency, Dickens and Henderson set up spray plots in a commercial orchard at Paonia. Uniformity in size and age of trees and prevalence of powdery mildew determined the selection of this orchard as suitable for the experiment. Five randomized complete blocks (replications) were used. Each block contained three trees per treatment. Three blocks were of the Jonathan variety and two of the Rome Beauty variety.

The chemicals tested were Karathane WD, micronized wettable sulfur, and Phytoactin L 307, used at the rates of ¾ pound, 6 pounds, and 200 parts per million, respectively, in 100 gallons of water. Triton B-1956 spreader was added to Karathane WD and micronized wettable sulfur but not to Phytoactin L 307. All three materials were applied three times: at cluster-bud stage on May 6, at calyx stage on May 20, and as a first cover spray on June 2. Approximately equal volumes of spray were applied to all trees each time. Two additional cover sprays were applied to the Karathane WD plots, on June 16 and July 4. Spraying was done at the time of day when drift was least and the data obtained showed no detectable influence of drift.

On July 9 visibly infected twigs 1 foot long or longer were counted on the west half of the center tree of each replication. No phytotoxic effects were observed. The counts showed obvious differences among treatments in extent of powdery mildew infection. Table 1 gives a summary of the results of the trials. Statistical differences were highly significant among treatments but were not significant among replications. Apparently both varieties were equally susceptible to powdery mildew.

Dickens and Henderson commented particularly upon the outstanding control of apple powdery mildew obtained with sprays of Karathane WD and micronized wettable sulfur. Phytoactin L 307, although it showed some promise, was less effective than either of the other materials. The cost per application was about the same for Karathane and sulfur. The difference in effectiveness of the two materials was not great, but the sulfur was somewhat more effective. However, according to Dickens and Henderson the sulfur cannot be used as a cover spray because it causes fruit russetting during periods of high temperature.

Dickens and Henderson concluded that either Karathane WD or micronized wettable sulfur, properly applied according to current recommendations at intervals of not more than 14 days beginning at the cluster-bud stage, should give excellent control of apple powdery mildew.

Table 1. Control of powdery mildew of apple by chemical treatment.

Chemical	Infected shoots[a]	Percent control[b]
Sulfur	31.60	87.6
Karathane WD	46.40	81.8
Phytoactin L 307	90.40	74.5
None	255.00	0.0

[a]Average number of mildew-infected shoots per half tree for five replications.
[b]Percentage reduction in prevalence of mildew-infected shoots as compared with non-treated.

Captan For Control Of Black Spot of Roses

H. R. Rosen, of the University of Arkansas, noted[2] that rose growers face some unusual problems in their attempts to control diseases, because of the indeterminate type of growth of the plants and the continuous blooming period, which constantly produce new vulnerable host tissue and make it difficult to keep the plants adequately protected between applications of chemicals. Of course the longer the time that elapses between applications the greater will be the amount of new growth.

To obtain satisfactory control under such conditions a fungicide that possesses systemic properties is necessary. Published results of investigations by other workers elsewhere suggested that captan might have the needed qualities. Accordingly Rosen planned a preliminary trial to determine

[1]L. E. Dickens and W. J. Henderson, "Comparative treatments for powdery mildew of apple," *Plant Disease Reporter*, vol. 43, No. 12, page 1263. Dec. 15, 1959.

whether captan applied to the soil might protect rose bushes against black spot, caused by *Diplocarpon rosae*. He used three replications of five plants each of three susceptible varieties. Plants treated with captan applied to the soil were compared with plants sprayed or dusted with several other fungicides and with untreated check plants. Captan applied as a foliar spray had previously been shown to be effective against black spot; therefore in these tests it was not used as a spray.

The first soil application of captan was made on April 24, 1959, when black spot had become general enough in the plots to permit uniform spread later. Captan was used at the rate of 5 pounds of 50 per cent powder per 25 square feet. It was applied by hand around each plant as evenly as possible and worked lightly into the top soil with a hoe. Because of some indication that a single soil treatment might not be sufficient for the entire season, a second application of the same amount was made by the same method on May 24.

Abundant rainfall between the two applications and after the second application of captan provided favorable conditions both for spread of black spot and for transport of the fungicide through the soil to the root systems of the treated plants. The two kinds of understock, *Rosa multiflora* and Ragged Robin (Gloire des Rosomanes), from which the root systems were derived did not appear to differ notably in reaction to the captan soil treatment.

The plots were examined frequently for possible injury from the soil treatment and for inspection on the foliage. Anthracnose, caused by *Elsinoë rosarum*, and drought injury increased as the season advanced and complicated the determination of amount of infection and especially of the defoliation due to black spot.

[2]H. R. Rosen, "Preliminary report on the systemic activity of captan when applied to the soil for the control of black spot of roses," *Plant Disease Reporter*, vol. 43, no. 11, pages 1176-1177, Nov. 15, 1959.

Table 2. Comparative amounts of black spot of roses in plots with different fungicidal treatments.

Variety	Type of treatment	Percent of black spot
Peace	Captan on soil	trace
Peace	Captan on soil	10
Aztec	Captan on soil	trace
Pink Peace	Weekly orchard oil spray	trace
Pink Peace	Weekly Acti-dione PM spray	5
Green Fire	Untreated control	30
Ruby Lips	Untreated control	30

By a few weeks after the first captan soil treatment black spot was clearly less prevalent on the treated plots than on untreated ones. Estimates of amount of black spot made on May 28 are shown in Table 2. The trace of black spot noted on plants in plots given captan soil treatment was probably due to infection that took place before the fungicide was applied. No black spot was seen on new growth, and no additional infection was observed until early July. By that time untreated control plants had lost 90 percent of their leaves, mostly from black spot, and considerable defoliation was evident also in many of the plots given weekly applications of sprays or dusts of various fungicides. In contrast, up to the middle of July defoliation of plants in the three plots given captan soil treatment was slight and appeared to be caused mostly by anthracnose and drought injury rather than by black spot.

Rosen considered the results to indicate that captan applied to the soil undoubtedly acted as a systemic fungicide for control of black spot. However, it did not control powdery mildew, caused by *Sphaerotheca pannosa* var. *rosae*, or anthracnose.

In contrast to black spot, powdery mildew was scattered throughout the plots. Some plants of the same variety had considerable infection, some only slight infection, and others none. In the plots that received captan soil treatment powdery mildew occurred on only a few plants, but these few were enough to show that no control was obtained. This result is in accord with reports of other investigators to the effect that captan applied as a foliar spray does not control powdery mildew.

Anthracnose was not controlled by the captan soil treatment, nearly so well as black spot was. Although anthracnose became prevalent later in the season than black spot, it caused much defoliation, and was not satisfactorily controlled by any of the fungicides tested except possibly COCS applied as a weekly spray.

In conclusion, Rosen emphasized the preliminary nature of his experiment.

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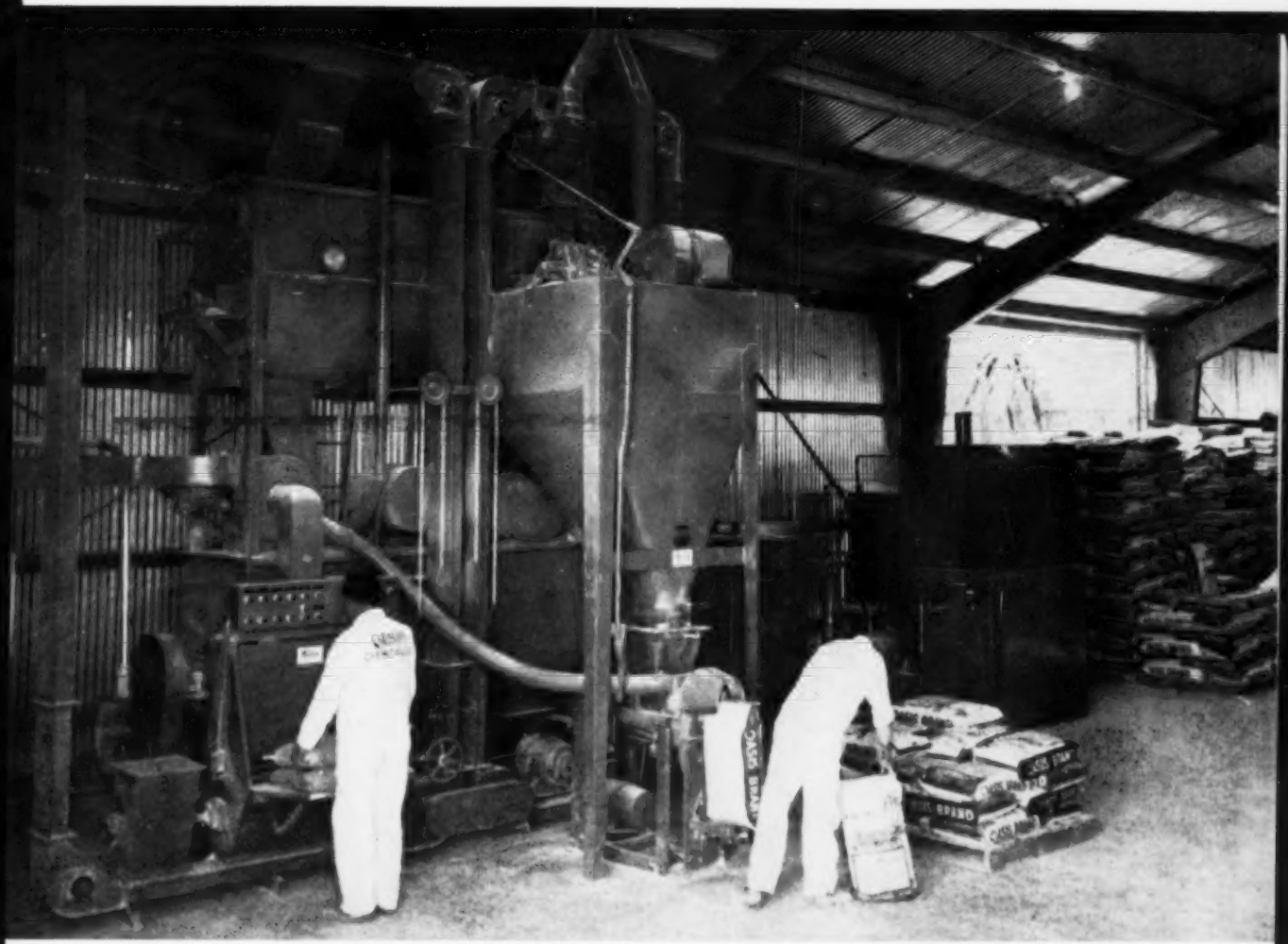
N. C. Soil Science Meeting

Approximately 125 persons attended the third annual meeting of the Soil Science Society of North Carolina, Feb. 4 and 5, in Raleigh. A featured speaker was L. Y. Ballentine, commissioner of agriculture for North Carolina. He said that the average American does not know that, although we have what are called farm surpluses today, we could easily have serious shortages tomorrow. We could have hunger and scarcity in the next 20 years if we let up on our research programs.

S. L. Tisdale, southeastern regional director of the National Plant Food Institute, pointed out that, despite the inadequate use of lime in North Carolina as a whole, some counties had managed to increased the use of lime and fertilizers through intensified soil fertility programs. Fertilizer and lime dealers, he said, had participated in a more active merchandising effort to move their products and a real effort was made to impress the farmers in those counties with the importance of sound lime and fertilizer programs.



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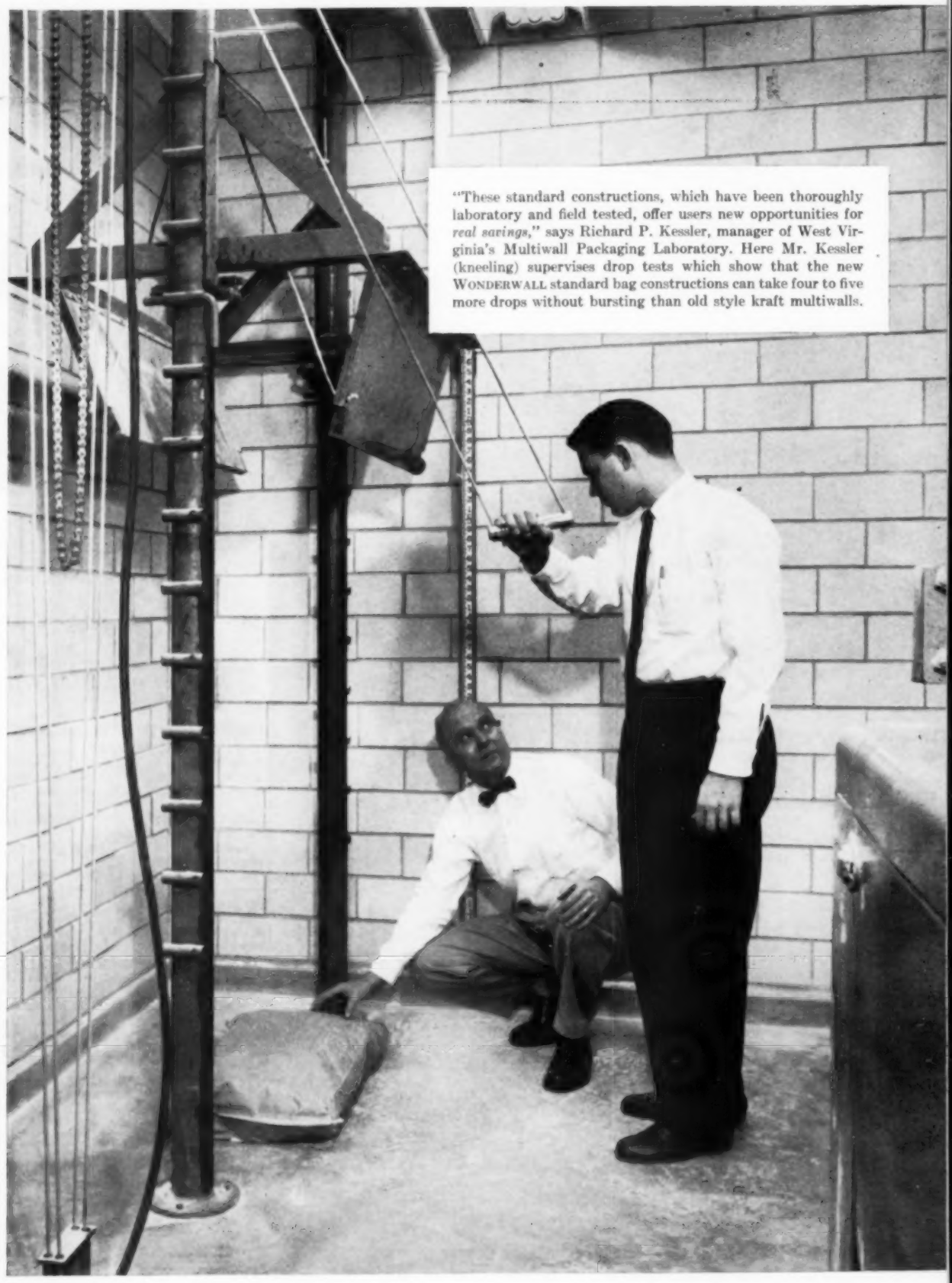


"These standard constructions, which have been thoroughly laboratory and field tested, offer users new opportunities for *real savings,*" says Richard P. Kessler, manager of West Virginia's Multiwall Packaging Laboratory. Here Mr. Kessler (kneeling) supervises drop tests which show that the new WONDERWALL standard bag constructions can take four to five more drops without bursting than old style kraft multiwalls.

NEW!

WEST VIRGINIA'S 1960 STANDARD BAG CONSTRUCTIONS TO SAVE YOU MONEY

Major savings for fertilizer packers are being achieved by three new standard WONDERWALL bag constructions perfected by West Virginia.

During a controlled test to determine possible savings in bag costs, various WONDERWALL constructions were developed in our Multiwall Packaging Laboratory. They were tested by 101 packers who shipped 569,224 tons of fertilizer in 12,307,546 WONDERWALLS.

The three recommended standard constructions and their actual savings, as used in normal conditions, are shown in the box.

For example, where a typical 100# old fashioned kraft bag usually would require 1/90 AL, 2/40, 1/50 for a total of *four* plies, the new standard WONDERWALL provides the same or superior strength with *three* plies: 1/100 AL, 1/40, 1/50 . . . at a saving of $3.50 per M.

Secret of WONDERWALL's strength is Kraftsman Clupak*, the paper with the built-in stretch that withstands far more impact without breaking than conventional natural kraft multiwalls. In a WONDERWALL bag, fewer plies are needed to do the job!

See how WONDERWALL standard bag constructions can *cut your costs, increase your profits.* Our technical service experts are ready to help you take full advantage of these new bag developments; call or write Multiwall Bag Division, West Virginia Pulp and Paper Company, 230 Park Ave., New York 17, N.Y.

Clupak, Inc.'s trademark for extensible paper manufactured under its authority.

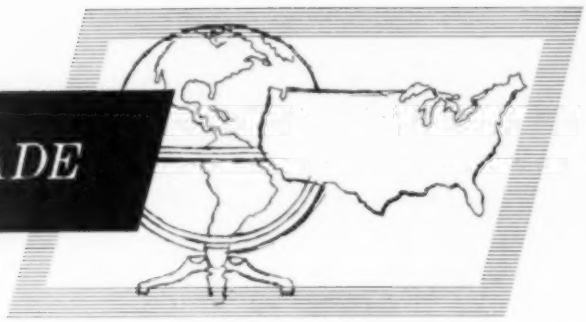
NEW STANDARD WONDERWALL FERTILIZER BAG CONSTRUCTIONS

Pounds Packed	Old Style Natural Kraft Construction	New Wonderwall	Actual User Savings
100#	1/90AL, 2/40, 1/50	1/100AL, 1/40, 1/50	$3.50/M
80#	1/90AL, 2/40, 1/50	1/100AL, 1/40, 1/50	$3.10/M
50#	1/90AL, 1/40, 1/50	1/100AL, 1/60	$3.80/M

Smith-Douglass Co., Inc., Norfolk, Va., has shipped over 50,000 tons of fertilizer and related products in a million new WONDERWALL 100# standard construction bags. They report excellent results with a saving of $3.50 per M and reduced bag breakage.

West Virginia Pulp and Paper

NEWS about the TRADE



Grady Elected Calspray Head

Howard J. Grady was named president of California Spray-Chemical Corp., Richmond, Calif., following the

H. Grady

A. Mohr

retirement on February 1 of A. W. Mohr, president for the past 13 years. Mr. Grady also becomes president of Ortho Agricultural Chemicals Ltd. of Canada.

Mr. Grady, who was executive vice president at the time of his new appointment, joined the California Spray-Chemical Corporation in 1926 as a research entomologist. From 1931 to 1939 he served as Calspray's European representative. Mr. Grady subsequently was named branch manager of Calspray's Portland office and later became manager of the Pacific Northwest Sales District. In 1948 he was sent to Washington, D. C. as regional manager, marketing — east. He joined the head office in Richmond, California, in 1956 as executive vice president.

Mr. Mohr began his career in 1922 as a chemist and sales engineer with Standard Oil Company of California in the fuel oil and asphalt laboratories, which later became American Bitumuls. In 1930, he was appointed district manager for the American Bitumuls Company in St. Louis and, later, in Baltimore, Maryland. He was appointed to the Calspray board of directors in 1947 and shortly thereafter was elected president of the corporation.

•

Hercules Buys Nitroform Co.

Hercules Powder Co.., Wilmington, Del., has purchased the assets of Nitroform Agricultural Chemical Co., Woonsocket, Rhode Island. Nitrogen produces urea-formaldehyde fertilizer compounds..

Production under the tradename of Hercules-Nitroform Blue Chip, a granular free-flowing fertilizer, and Hercules-Nitroform Powder Blue, a wettable powder, will continue at Woonsocket. Additional facilities are expected to be in operation this summer at Hercules, Calif. Urea-formaldehyde fertilizers are widely used for feeding turf grasses and ornamentals.

•

Southern Nitrogen To Buy

The Southern Nitrogen Co. has agreed to purchase for a number of years 30 per cent of the ammonia production of the plant that the U. S. Phosphoric Products division of the Tennessee Corp. will build at its East Tampa, Fla., works.

Southern Nitrogen will use the ammonia for the processing of nitrogen fertilizer products at a new plant it is building at Tampa.

•

Hall Is Northwest Manager

Thomas A. Hall has been appointed northwest manager by Colloidal Products Corp., Sausalito, Calif. Mr. Hall's previous experience includes aerial crop dusting and spraying activities, the operation of a fruit orchard, and technical sales work in the agricultural chemicals field.

•

African Plant To Operate

African Explosives & Chemical Industries Ltd., plans to start operations by June at its new 110,000 ton urea plant being constructed at Modderfontein, Union S. Africa.

•

Add Granulating Unit

The Cotton Producers Association is adding a fertilizer granulating unit to their Cordele, Georgia, plant. The D. M. Weatherly Co., Atlanta, is installing complete facilities.

ACS Meets in Cleveland Apr. 5

New insecticides will be evaluated at a session of the Division of Agricultural and Food Chemistry, when the American Chemical Society holds its 137th national meeting in Cleveland, Ohio. Some 1100 technical papers will be presented in sessions scheduled by 20 of the Society's divisions in the various fields of chemical science and technology.

•

Solar Expands Facilities

Solar Nitrogen Chemicals Inc., Wilmington, Del., has begun an expansion of the ammonia, urea, nitric acid, and nitrate facilities at its Lima, Ohio, plant. Solar Nitrogen is jointly-owned by the Atlas Powder Co. and the Standard Oil Co., Ohio.

•

Joseph Howell Dies

Joseph A. Howell, former president of the Virginia-Carolina Chemical Corp., Richmond, Va., died Feb. 16 in Washington, D. C. He was 58 years old.

Mr. Howell headed the company from 1949 until 1956. Since then he had been a consultant to the agricultural chemical industry.

Instrumental in the formation of the National Plant Food Institute, Mr. Howell was its first president, in 1955.

R. Ashcraft, Pres.

Robert E. Ashcraft has been elected president of Ashcraft-Wilkinson Co., Atlanta, Ga. He succeeds the late Trenton Tunnell.

At the same time, W. Mercer Rowe Jr., a vice president of the company since 1954, was named executive vice president and O. Ray Yates was elected vice president.

R. Ashcraft

R. Yates

M. Rowe

Mr. Ashcraft, who joined the company in 1929, became executive vice president in 1959. Mr. Rowe joined Ashcraft in 1947 as vice president of a subsidiary, Flag Sulphur & Chemical Co.

Mr. Yates joined Ashcraft-Wilkinson as a sales representative in 1948 and succeeded Mr. Ashcraft as Norfolk branch manager in 1955.

Landsiedel Elected CAA Pres.

M. Landsiedel, Monty's Agricultural Aviation, Des Moines, was elected president of the California Agricultural Aircraft Association, when James K. Vedder resigned this office on February 15, 1960. Other officers elected for 1960 are: vice president, W. S. Fink, Patterson Flying Service, Patterson; secretary-treasurer, Joun C. Coulston, McLoughlin Dusters, Inc., Oxnard; and re-elected as executive secretary, Wanda Branstetter.

•

WACA Meeting March 22

The spring meeting of the Western Agricultural Chemicals Association, to be held March 22nd at the Miramar Hotel, Santa Barbara, Calif., will include reports on "Development and use of California land for agriculture, by D. G. Aldrich, Univ. of Calif.; "Research and development of commercial pesticides," by S. H. McAllister, Shell Chemical Corp.; "Marketing agricultural chemicals," W. R. Dixon, Dow Chemical Co.; Absorption, movement and action of 2,4-D," F. M. Ashton, Univ. of Calif.; "Aerial Spray programs," J. R. Dutton; USDA; "Marketing aspects of the agricultural chemicals business," C. E. Cody, California Spray Chemical Corp.; "Granular pesticides," L. C. Glover, Shell Chemical Corp.; and "Pesticide-fertilizer mixes," A. B. Horner, Best Fertilizer Co.

•

New Pennsalt Office

Pennsalt Chemicals Corp., Philadelphia, has established an agricultural chemicals office at 400 Park Avenue, New York.

Kenneth A. Spencer Dies

Kenneth A. Spencer, chairman of the board and founder of Spencer Chemical Co., died Feb. 19 in Miami Beach, Fla. He was 58.

Snook Joins Houston Co.

Robert L. Snook has been named vice president of Gordon M. Houston Chemicals, mfrs, of emulsifiers, Sugarland, Texas. He was previously with Magnet Cove Barium Corp., Houston, suppliers of pesticide diluents, as sales manager.

•

Gypsy Moth Case Appealed

An appeal from a Circuit Court ruling of last October, denying an injunction to a group of Long Island residents who sought to halt the 1958 Gypsy Moth spray program, has been docketed with the U. S. Supreme Court. The government was to file its answering petition by Feb. 26.

Tax Exempt Privileges of Coops Reviewed at Wash. Hearings

THE chemical industry last month asked Congress to cut back the tax advantages enjoyed by farmer cooperatives which have been moving into the chemical manufacturing field with their own production of nitrogen, phosphates and potash. In hearings before the house ways and means committee, spokesmen for the industry said that tax-exemption privileges of co-ops permit them to accumuate equity capital tax-free.

Testifying were: William H. Horne, Jr., Olin Mathieson Chemical Corp., Baltimore; Lawrence A. Coleman, Allied Chemical Corp., New York; Joe E. Culpepper, Spencer Chemical Co., Kansas City, Mo.; and Edwin J. Putzell Jr., Monsanto Chemical Co., St. Louis, Mo. The ways and means committee is considering legislation to close loopholes in existing tax laws.

The bill, HR 7875, introduced by the late Rep. Richard Simpson of Pennsylvania, proposes to equalize the tax burden between industry and the cooperatives by imposing levies on the patronage dividends of the cooperatives under certain conditions. This is not satisfactory to the chemical industry,

(*Continued on Page* 111)

Time Attacks "The Co-op Tax Dodge"

The virtual immunity of co-ops from income taxes is a loophole in the tax laws which Congress should take immediate steps to close, in the opinion of the publishers of *Time* magazine, as expressed in an editorial in the February 15th issue of that publication. More than 10,000 co-ops gross more than $13 billion a year, *Time* points out, yet pay less than 6% of their profits in federal and state income taxes. This compares with the heavy tax burden borne by their commercial competitors, including the 52% corporate tax alone.

Originally, it is pointed out, co-ops were "small, neighborhood associations set up to improve farmers' competitive position by pooling their marketing and purchasing power. As a desirable type "infant" industry, Congress felt it wise to aid them with a favorable tax status. Under this preferred tax status they have expanded enormously, spreading far afield from agriculture into the operation of hundreds of unrelated businesses. Many tax experts, the editors of *Time* observe, now feel that it is high time that co-ops paid taxes. They quote former Under Secretary of the Treasury Roswell Magill as saying "The exemption may have been necessary in the infancy of co-operatives. Now that cooperatives have come of age, it is quite unnecessary to their continued growth and health."

Time also points out that "no other country grants cooperatives such tax advantages." France allows no corporate tax exemption on profits paid to members of co-ops. Belgium disallows allocations, which American co-ops use to avoid taxes. Canada and Denmark levy regular corporate taxes on a minimum of 3% to 6% of capital invested in co-ops.

From ship to train or shoreside storage . . .

TWO MILLION POUNDS OF BULK MATERIAL

handled daily by 8 Michigan Tractor Shovels

On Philadelphia's waterfront, eight high-speed tractor shovels are moving the amazing total of two million pounds of bulk material *every 8 hour shift!*

The machines are 16 cubic foot Model 12B Michigans. Their job, for Independent Pier Co., is to transfer England-imported china clay from temporary shipside hoppers to waiting rail cars and storage bins. Despite the high-volume output, it's not an easy assignment. Material, when disturbed, rises in choking clouds of dust, quickly covering men and machines. Loads must be moved through traffic *60 to 900 feet*. And all work has to be done quickly to minimize high dock charges.

Under these pressures, Independent Pier has developed probably the fastest operation of its type along the waterfront—built around the speed and mobility of the eight Michigans.

Load-unload cycle averages 58 seconds

Approaching the hopper head-on, bucket skimming the dock, a Michigan in typical operation thrusts into the heaped clay. With flick of tilt-action lever, operator brings up his pay-load. No time is lost in repeated bucking; Michigan's pry-out action heaps bucket in a few seconds. At same instant, a flip of the forward-reverse lever backs the Michigan out of the hopper in a fast, tight turn. In "forward" again, the Michigan races for a boxcar, barely slowing to turn in—even through narrow six-foot doors. To heap

the clay as high as possible in either end of the car, the Michigan charges up the slope as if it were a hill. At top, operator simultaneously dumps bucket and power-shifts into reverse; the Model 12B backs down and swings out the door, ready to repeat the cycle. Operating at top speed through thick dust fog, over round trip haul cycles of 120 to 1800 feet, the Michigans have established a load-unload average of only 58 seconds!

Maintenance, new operators no problem

"Maintenance-wise" says master mechanic Mike Snowden Jr, "there's no comparison between these Michigans and other equipment. They not only need a lot less attention, they're much easier to service. A quick check at lunchtime—mainly knocking dust out of air filters—keeps them in top shape. Ruggedness and ease of operation are advantages, too. Hiring new stevedores every day means new operators for the Michigans—and *could* cause trouble. But new men learn fast on those simplified controls. They don't have to fight a clutch, either, and power steering is a big help pushing around in that clay."

Find out how Michigan ease of handling, speed and dependability can help *you*. Write us any time for complete details . . . or, better still, to arrange a no-obligation demonstration on your job.

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2463 Pipestone Road
Benton Harbor 6, Michigan

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CLARK® EQUIPMENT

Truitt Elected NPFI Head As Coleman Joins Sulphur Group

Paul T. Truitt

Russell Coleman

PAUL T. Truitt was elected president of the National Plant Food Institute, effective March 1, at a meeting of the organization's board of directors in Chicago Feb. 10. The action was taken when Dr. Russell Coleman left the NPFI to become president of the newly-formed Sulphur Institute. Mr. Truitt and Dr. Coleman had been executive vice presidents of the NPFI, a position that has been abolished.

As president, Mr. Truitt succeeds J. D. Stewart Jr., who was elected to the newly-created position of vice chairman of the board of directors. Mr. Truitt has been executive vice president of the Institute since July 1955. Previously, he served for four years as president of the American Plant Food Council, which was consolidated with the National Fertilizer Association in 1955.

Dr. Coleman, who also had been with the NPFI since 1955, has been named president of the international research organization effective March 1. The Sulphur Institute's headquarters are in Washington, D. C. and the group also has a European office in London. The purpose of the Institute is to expand world consumption of sulphur by appraising its benefits to agriculture and industry through research and education programs. Dr. Coleman's earlier experience includes service as director of the Mississippi Agricultural Experiment Station.

Mr. Truitt was, from 1943 to 1950, president of the National Association of Margarine Manufacturers. During his administration, the Federal Margarine Law imposing taxes and license fees on margarine, as well as numerous state laws prohibiting the sale of yellow margarine, were repealed, and the production of margarine reached record highs. As executive vice president of NPFI, Mr. Truitt has been active in traffic matters, especially in opposing freight rate increases.

•

California Pesticide Conference

MORE than 300 representatives of California and Arizona firms or organizations dealing with insecticides attended a two-day conference presented by the University of California on the Riverside campus last month.

Dr. Robert L. Metcalf, chairman of the department of entomology, University of California, Riverside; Dr. M. M. Barnes, associate entomologist; and A. S. Deal, extension entomologist, presided at the conference's three sessions. Mr. Deal pointed out some of the problems resulting from recent federal action on crop residues. He said that, since Heptachlor has been given a zero tolerance, substitute insecticides must be found for wireworm control on root crops and for two weevils in alfalfa. On root crops, DDT or Aldrin can be substituted without difficulty, he said, but on alfalfa the only effective substitute is Parathion.

Parathion, however, is harmful to beneficial insects in alfalfa, Mr. Deal said, and its use may threaten the biological control of the spotted alfalfa aphid.

Dr. R. B. March, entomologist, termed the general problem of resistance to chemical control by biological organisms a problem of "ever-increasing magnitude". So far, he said, insecticides have been hit harder than other chemical control agents such as antibiotics, fungicides, nematocides, and herbicides, but these probably will be affected in the future.

Dr. H. T. Reynolds, associate entomologist, told the conference that the real potential of systemic insecticides in agriculture is far from achieved. He outlined several problems, such as how to increase plant uptake and persistence of systemics, and how to use them as a remedial measure rather than as a preventative measure; that must be solved before systemics will be of maximum use.

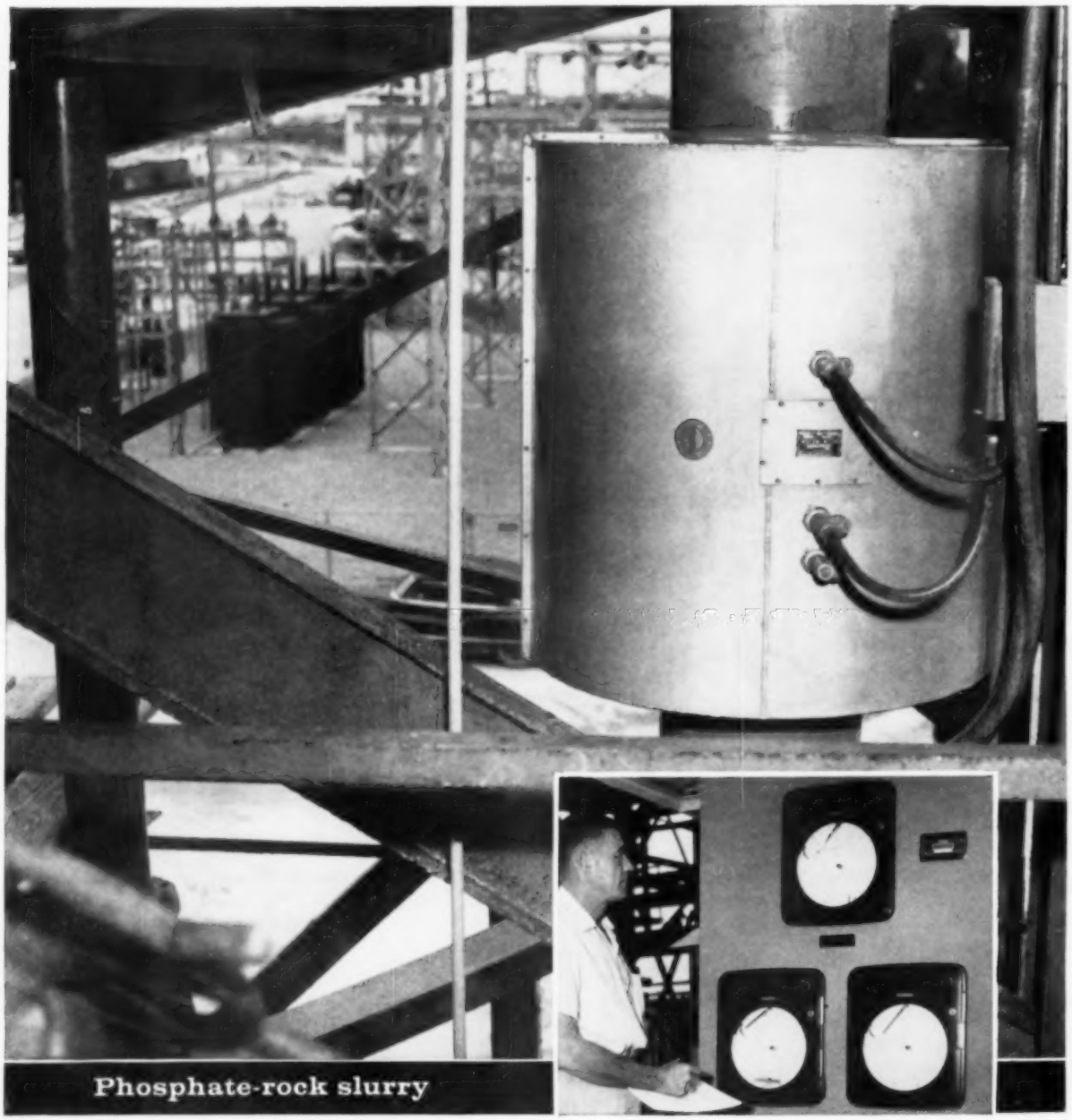
Entomologists Walter Ebeling and I. B. Tarshis, both of UCLA, said they have found silica aerogels (silikil) excellent for killing cockroaches and fleas and for keeping out drywood termites. Silica dioxide dust killed 100 per cent of German cockroaches in an hour and a quarter, while American and Oriental cockroaches died within four or five hours, they reported.

A report was presented by Dr. H. H. Shorey, junior entomologist, on 1959 studies in coastal and desert areas of southern California to find means of more effectively controlling cabbage loopers, corn earworms, green peach aphids, thrips, and leaf miners on various vegetable crops. An excellent control of green peach aphids, which, Dr. Shorey said, have become increasingly difficult to kill with Parathion or Diazinon, was obtained by the use of Thiodan. Continuing, Dr. Shorey reported that

(*Continued on Page* 111)

at International Minerals –

sand, acid, rock . . . nothing stops



Phosphate-rock slurry

This 16" Foxboro Magnetic Flow Meter is part of a mass-flow system for measuring phosphate rock slurry pumped to flotation plant. Meter measures slurry in gpm, while nearby gamma ray density cell measures density of solution. The two variables are recorded separately, and their product is then recorded in dry-tons-per-minute on the third Dynalog instrument on the panel above. Recorder readings are telemetered to mine head so operators will know how much rock to feed into pipeline.

the Foxboro Magnetic Flow Meter

"One meter even paid for itself in 4 months" –

reports J. H. Andrews, senior development engineer

You'd travel a long way to find a process with as many meter-killing liquids as at International Minerals and Chemicals Corp., Bartow, Florida. Phosphate-rock slurries, sand-water slurries, phosphoric acid — yet they're all metered accurately, continuously with Foxboro Magnetic Flow Meters.

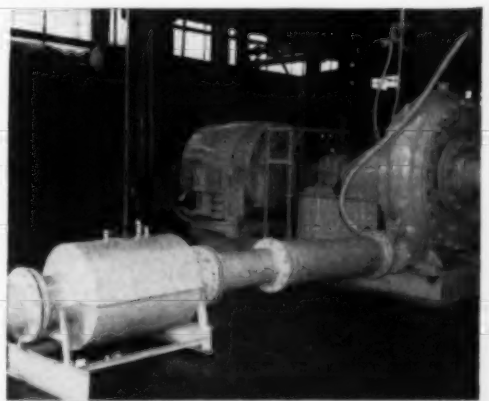
The Magnetic Meter is perfect for such "difficult liquids." It has no flow restrictions of any type — nothing to plug up. Instead, electrodes flush-mounted in corrosion-proof meter wall sense flow rate magnetically — send a linear proportional signal to a Foxboro Dynalog* Electronic receiver.

Magnetic Meters are installed as simply as a length of pipe — require no special meter runs, or straightening vanes. Maintenance is virtually nonexistent.

Ask your Foxboro Field Engineer for full details on the high-accuracy, low maintenance Magnetic Flow Meter. The Foxboro Company, 3612 Neponset Ave., Foxboro, Mass.

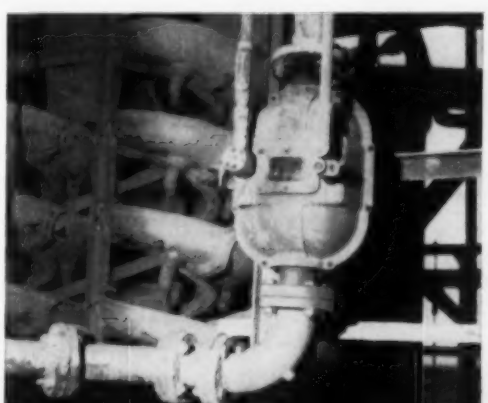
Reg. U. S. Pat. Off.

Write for Bulletin 20-14.



Sand-water slurry

International Minerals uses this 12" Foxboro Magnetic Flow Meter to control pumping rate of sand and water slurry. Foxboro Dynalog Controller holds pump discharge within ±1% of its 6000 gpm capacity. Slurry is so abrasive, entire pump unit must be replaced every six weeks. Only work done on Magnetic Meter, however, has been one "preventive maintenance" liner replacement during 3 years of continuous operation.



Phosphoric acid

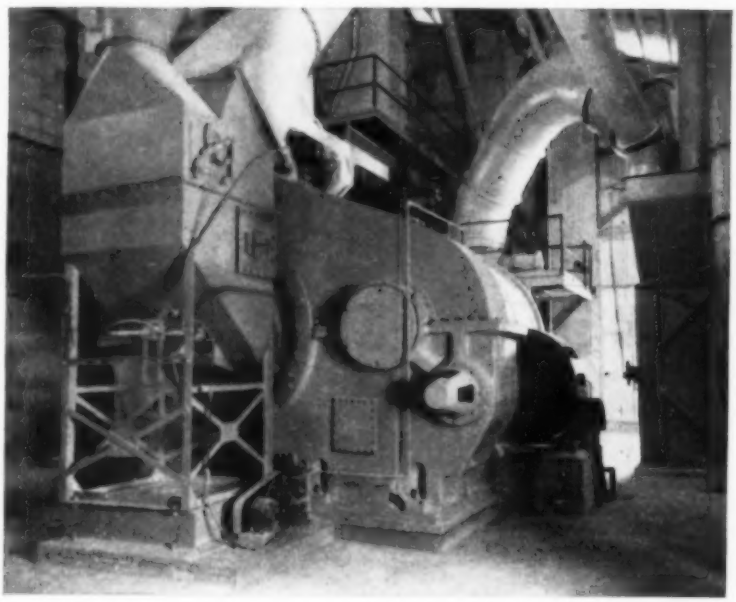
One of six Foxboro 3" Magnetic Flow Meters at International's Bonnie Chemical Works. Meters measure phosphoric acid with better than ±1% accuracy. Although meters have been operating up to 4 years, under highly corrosive conditions, none have ever required maintenance.

FOXBORO

REG. U. S. PAT. OFF.

LOWER
production costs with a
KENNEDY
air swept grinding system

The KENNEDY Air Swept Tube Mill Grinding System is the ultimate in high production and low operating cost. The experience of the many owners of KENNEDY Mills has shown that the cost of this mill can be paid in a few years with the savings in maintenance and power alone!



KENNEDY 10′ x 15′ Integral Gear Drive Air Swept Ball Tube Mill and #93 Exhauster Fan in service at the American Agricultural Chemical Co., Pierce, Florida.

HERE ARE A FEW OF THE REASONS FOR THE ECONOMY AND POPULARITY OF KENNEDY PULVERIZING SYSTEMS...

REDUCED MAINTENANCE • Tramp iron and other foreign material cannot damage the system. Years of operation are assured before parts (except for grinding balls) require replacement.

CONTINUITY OF OPERATION • Lubrication and replacement of grinding media is accomplished without shutdown or interruption of production.

MINIMUM POWER • Careful design and construction and a proven pressure lubrication system insure a high mechanical efficiency.

HIGHER PRODUCTION • Single grinding units are built for capacities to 100 tons per hour. Production and fineness remain constant, month after month.

LOWER OPERATING COSTS • Dependability of equipment and reliable automatic feed control assure high production with minimum manpower.

CAPITAL SAVINGS • No magnetic separators are required. KENNEDY units require less structural steel and floor space per ton of product.

FLEXIBILITY OF DESIGN • KVS Air Swept Grinding Systems are available for a wide range of capacities and products.

K V S

Send now for full details on KENNEDY Size Reduction Equipment.

KENNEDY VAN SAUN

MANUFACTURING & ENGINEERING CORPORATION

405 PARK AVENUE, NEW YORK 22, N.Y. • FACTORY: DANVILLE, PA.

Large Ammonia Use Is Cited At Dallas Convention Of AAI

SPEAKERS at the Agricultural Ammonia Institute's Dallas convention, Jan. 13 to 15, declared that promotional efforts which have made ammonia the No. 1 direct application nitrogen fertilizer now are having a snowballing effect in bringing acceptance by even the most conservative segments of American agriculture.

They also pointed out that the ammonia distributor must be considerably more than a salesman—he must have some knowledge of chemistry, soil physics, and agronomy—if he is to take full advantage of the almost explosive changes occurring in agriculture.

Dr. Thomas Longnecker, director of the High Plains Research Foundation, Plainview, Texas, said that the use of adequate nitrogen in just 60 East Texas counties could mean $300,000,000 more net income for the state. The same is true of many other areas, he declared, adding that business and financial leaders are becoming increasingly aware of the role played by ammonia and other plant foods in increasing net income for farmers.

Dr. Longnecker's discussion of ammonia's role in agricultural changes was followed by explanations of sales techniques by the Merritt-Adams Training Institute and by Elmer Wheeler, Dallas merchandising specialist.

Carl J. Bauserman, Southern Michigan Nitrogen Co., Richland, Mich., was elected president of the Agricultural Ammonia Institute at the Dallas meeting.

H. A. Yeats, treasurer of Southwest Wheel, Inc., declared that advancements in financing and credit knowledge must parallel the expanding role of the ammonia distributor. Thomas Duffie, ammonia distributor of Chillicothe, Texas, focused attention on the coordination of technical and sales knowledge necessary for the progressive distributor's business.

The executive vice president of the institute, Jack F. Criswell, said that preliminary reports indicated that about 700,000 tons of ammonia have been used for direct application in the year which ended June 30, 1959. This contrasts with 583,434 tons for the previous year, he said.

Niagara Appoints Two

Niagara Chemical Division, Food Machinery and Chemical Corp., Middleport, N. Y., has appointed Dr. Robert W. Metz to a newly-created technical service post, working with sales representatives. His headquarters are at Middleport and his territory encompasses New York, Pennsylvania, New Jersey, Maryland, Delaware, Virginia, West Virginia, Washington, D. C., and North Carolina.

At the same time, the company announced the appointment of Dr. Irwyn Rammer as a research entomologist. He is located at Niagara's Richmond, Calif., facilities. Dr. Rammer had been a research assistant at the University of California.

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Barrow Moves To Raleigh

Mancefield Barrow, a senior technical sales service representative in the Hercules Powder Co.'s Naval Stores Department, has been transferred to the department's Raleigh, N.C. office.

•

Becnel Heads SE Branch

Irwin J. Becnel, director of agricultural research for the Freeport Sulfur Co., New Orleans, was elected chairman of the Southeastern Branch, Entomological Society of America, at the branch's annual meeting in Savannah, Ga., Jan. 25 to 27. He succeeds F. E. Guyton of Auburn, Ala.

Other newly-elected officers are: Dr. Carrol W. Smith, USDA, Orlando, Fla., chairman-elect; Dr. John S. Roussel, Louisiana Agricultural Experiment Station, Baton Rouge, secretary-treasurer.

•

Di-Syston Placed On Market

Di-Syston, a systemic insecticide for cotton pests that was recently registered for use nationally by the U.S. Department of Agriculture, has been placed on the market by the Chemagro Corp., Pittsburgh, Pa.

Tests have indicated that Di-Syston is effective against aphids, mites, and thrips. It is applied in granular form to the ground at the same time the cotton seeds are planted and is said to give protection up to seven weeks after seedlings emerge.

•

Floridin Opens New Offices

Floridin Co., Tallahassee, Fla., has opened sales offices in New York, St. Louis, and Dallas.

•

Texas Gulf to Build

The Texas Gulf Sulphur Co., New York, plans to construct a plant for the treating of sulfur by filtration at its Spindletop mine near Beaumont, Texas.

The plant will operate in connection with nearby shipping facilities at the company's new Neches River Terminal. Completion is scheduled for mid-summer.

•

To Manage West Coast Plant

George E. Nelson has been appointed production manager of the San Francisco bag manufacturing plant of the Bemis Bros. Bag Co., St. Louis. He succeeds Frank W. Peters, who has been named facilities engineer.

The San Francisco plant will be moved early this summer to new facilities at Newark, Calif.

HOW LION E-2* HELPS YOU GET THE

Lion E-2 Ammonium Nitrate has distinct advantages that can make your selling job easier, quicker, and more profitable.

Lion E-2 is the only ammonium nitrate on the market that can save 20 to 25% of your valuable storage space. Because each Lion E-2 prill is physically concentrated, you can stack *five* 80-lb. bags of Lion E-2 in the same space previously taken up by just *four* 80-lb. bags of any other brand. The space you save can be utilized for larger inventories and larger profits.

Lion E-2 bags are easier to handle. They're specially "frictionized" with Monsanto Syton,® a special antislip agent for faster gripping, safer stacking. You can stack Lion E-2 higher without fear of bag damage due to slippage.

Lion E-2 saves your customers time when they need it most. Because Lion E-2 is concentrated, your customers can put up to one-fourth more material in their spreaders. They eliminate at least one out of every five refill stops. Lion E-2 spreads easily, produces the yields that build repeat business for you.

Lion E-2 is going to be seen, heard, and talked about by all of the folks in your county. Unusual advertising (and a lot of it) is going to make your customers "Lion-conscious." They'll recognize Lion E-2 as a dependable product that's guaranteed 33.5% vital nitrogen.

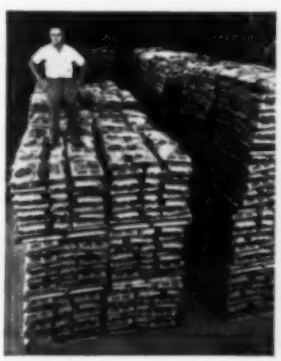
Get set now for the "lion's share" of business. Write LION E-2, Monsanto Chemical Company, St. Louis 66, Mo.

LION and SYTON: Reg. T. M.'s; "E-2: T. M., Monsanto Chemical Co.

"LION'S SHARE" OF AMMONIUM NITRATE SALES

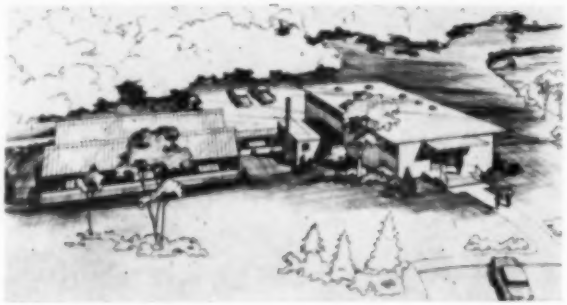
Lion E-2 is the only brand that saves 20 to 25% of your storage space. In your warehouse, or on your truck, you can stack *five* bags of Lion E-2 in the same amount of space previously taken up by just *four* bags of any other brand.

You can stack Lion E-2 higher, safer, faster. The bags are specially "frictionized" with Monsanto Syton, the antislip agent that reduces bag damage due to slippage.



Monsanto

Laboratory To Be Built On Carbide Research Farm



Union Carbide Chemicals Co., Division of Union Carbide Corp., New York, will build a biological research laboratory on its research farm at Clayton, N. C. The laboratory will conduct basic and applied biological research for the agricultural chemicals development program of Union Carbide.

Construction is expected to be completed in August. Plans call for the building to cover 10,000 square feet. Attached greenhouses will provide 2,700 additional square feet of space. In addition, Union Carbide is expanding its research farm to approximately 300 acres, about twice its original size.

Dayton Doubles Capacity

The Dayton Fertilizer Corp., Dayton, N. J., has installed a new wing at its plant to house a new screen, pulverizer, elevator and hopper that have enabled it to increase capacity to almost 200 tons per day of standard and special-formulation fertilizer. The new equipment was installed and engineered by the Sturtevant Mill Co., Boston.

•

Hercules Sales Up In 1959

Hercules Powder Co., Wilmington, Del., reported net sales and operating revenues of $283,650,000 for 1959, an increase of 20 per cent from the previous year's sales of $236,513,000.

•

Neil Heads New Department

Jas. F. Neil has been appointed manager of the newly-created technical chemicals department of Niagara Brand Chemicals, Division of Food Machinery & Chemicals Ltd., Burlington, Ontario, Canada. Mr. Neil becomes sales manager for Niagara's agricultural and industrial chemicals.

•

Hitchner Talks To Farm Club

Lea Hitchner, executive secretary, National Agricultural Chemicals Association, spoke last month at the the New York Farm Club on the use of agricultural chemicals.

He told the group that pesticides today are the most thoroughly safety-tested chemicals of any group offered to the American public. More than 2,000 tolerances have been established, and rapid progress is being made in clearing all chemicals used in the production, storage, and transportation of raw agricultural products. However, he declared, the pesticide industry today is facing a serious situation because of a change in administrative philosophies on the part of FDA. Mr. Hitchner said that this situation seriously affects the reputation of private industrial research and threatens the continued development of new pesticides.

Even more important, he said, confidencein the entire American food supply is being destroyed "when in fact we have the safest food supply of any country in the world." Among others speaking in defense of pesticides at the meeting was Dr. Bailey B. Pepper, Rutgers University.

•

Shell Water Weed Chemical

Dr. Rene Blondeau, staff member of Shell Development Co.'s agricultural research center at Modesto, Calif., reports that Aqualin herbicide has been successfully tested in irrigated areas of the western United States to control weeds in irrigation canals and ponds. Dr. Blondeau was speaking at the meeting of the California Weed Conference, Jan. 19.

He said that, following application of the chemical, the increase in carrying capacity of the canal becomes apparent in a few days and may last for 5 to 8 weeks. All typical submersed aquatic weeds and algae are susceptible, he said.

•

New Monsanto Herbicide

Canada's National Weed Committee has recommended that Avadex, a new herbicide produced by Monsanto Chemical Co., St. Louis, Mo., be registered and sold in Canada this year as a wild oat control in both small grains and row crops.

•

TVA Demonstration Meeting

The annual meeting of the Tennessee Valley Association of Test-Demonstration Farm Families will be held in Knoxville, Tenn., July 21 and 22. The program will include discussions of new and significant problems of farmers in the region, how farm families are working together in the solution of regional problems, and future opportunities for the test demonstration program.

•

Western Cotton Conference

The 1960 Western Cotton Production Conference was held in Bakersfield, Calif., March 1 to 2, at the Hacienda Motel. Among the speakers were John H. Miller, Cotton Field Station, Shafter, California, and P. J. Lyerly, Texas Agricultural Experiment Station, El Paso, who discussed problems and progress in weed control.

B. C. Rhodes, Arizona Cotton Growers Assn., Avondale, Arizona, told of the 1959 pink bollworm control program in Arizona. Insect control problems and recommendations were presented by three extension entomologists: J. E. Swift, Berkeley, Calif.; J. N. Roney, Phoenix, Ariz.; and John T. Durkin, University Park, N. Mex.

•

Martin Heads V-C Dept.

Robert R. Martin has been appointed manager of the Virginia-Carolina Chemical Corp.'s purchasing department. He succeeds Douglas W. Laird, who was named vice president last year. Mr. Martin joined V-C in 1951.

IMC Establishes New Technical Service Dept.

R. R. Heck | H. E. Causey | J. M. DeLong | C. E. Franklin

International Minerals & Chemical Corp., Skokie, Ill., has completed the organization of its new technical service department with the addition of five technical service representatives. They will work with customers on fertilizer problems.

IMC officials describe the department as a further step in the Full Orbit customer service policy of the company's agricultural chemicals division. The tehnical service personnel, who will operate from the five regional offices of the division, are: Robert R. Heck (left), former director of technical service, Southern Nitrogen Co., who is assigned to the Shreveport region; H. E. Causey (second from left), who will be in the Atlanta region, had been technical service representative with the company's former potash division; James M. DeLong (second from right), assigned to the Minneapolis region, has been with IMC since 1952; and Charles E. Franklin (right), who was manager of technical service for the fertilizer division of Phillips Petroleum Co., is assigned to Indianapolis. Not pictured is William W. Johnson, former technical service representative for Mississippi River Chemical Co., who is located in New York.

Peru Fertilizer Plant Opens

Peru's first chemical fertilizer plant has begun operations in Callao. The $7 million factory was built by Fertilizantes Sinteticos and has a capacity of 50,000 tons per year of nitrogenous fertilizers, phosphates, and other plant foods. It will supplement the 300,000 ton a year output of Peru's guano industry.

Twenty-one chemical pumps and several high pressure, motor driven compressors for the plant were supplied by the Worthington Corp.

•

Munson Sales Up

Munson Mill Machinery Co., Utica, N.Y., in a year-end statement issued last month, reported a "very substantial percentage of increase in sales over last year." The company also announced the introduction of a new ribbon blender.

•

Fisons Is Holding Company

Fisons Ltd., London, has become a holding company and the group's trading operations now are conducted through subsidiary companies.

The agricultural fertilizer business has been transferred to Fisons Fertilizers and the horticultural department now is Fisons Horticulture, which is a subsidairy of Fisons Fertilizers.

•

Weed Group Elects Darrow

The Southern Weed Conference, at its annual meeting late last month in Biloxi, Miss., elected Dr. R. A. Darrow of Texas A&M College, College Station, its president for 1960. He succeeds V. S. Searcy.

Walter K. Porter of Louisiana State University, Baton Rouge, was named vice president and Dr. R. E. Frans, University of Arkansas, was re-elected secretary-treasurer.

The group will meet next year at the Hotel Soreno, St. Petersburg, Fla., Jan. 18 to 20.

•

Canners Pesticide Policy

The National Canners Assn., at its 53rd annual convention in Miami Beach, Fla., Jan. 19, adopted a policy concerning the use of pesticides by growers.

Under the policy, canners processing crops that have been treated, or produced on land that has been treated, with a pesticide are urged to be certain that the chemical has been accepted for registration by the USDA. In addition, each canner should supply his growers with a list of pesticide chemicals which may be used on crops which he processes, the policy stated.

It was recommended that canners make periodic contacts with their growers to insure that pesticides are used properly.

In conclusion, the NCA policy stated that canners should participate in the development of an educational program on the proper use of pesticides in cooperation with extension services and pesticide manufacturers.

•

Strew Heads California Group

The California Weed Conference, in its 12th annual meeting at Sacramento, Jan. 20, named Stanley S. Strew, sales manager of Colloidal Products Co., Sausalito, as its president for 1960. He succeeds C. Bruce Wade, Shasta County Agricultural Commissioner.

Other new officers are: Dr. Oliver A. Leonard, associate botanist, University of California, Davis, vice president; William Hopkins, Amchem Products Corp., Niles, secretary; and Charles C. Siebe, district supervisor of rodent and weed control, California Department of Agriculture, Le Puente, treasurer.

The conference will meet in Fresno, Jan. 24 to 26, 1961.

•

Soil Testing Stressed

Soil Testing was a featured topic at one of the soil science programs during Farmers' Week at Michigan State University, East Lansing, Feb. 1 to 5.

John Shickluna, soil scientist, estimated that Michigan farmers use about 650,000 tons of fertilizer yearly. This, he said, represents an annual expenditure of about $50 million. Mr. Shickluna joined with Edward C. Longenecker, a soil specialist, to report new developments in soil testing and to demonstrate how a good soil sample is taken.

Other speakers reported on county soil testing programs, grouping soils for fertilizer recommendations, and on breeding corn to fit high plant population and high soil fertility levels.

last year over 100 firms lowered their multiwall bagging costs through UNION-CAMP'S

PACKAGING MACHINERY

another FREE service of the ★ **5** *Star Packaging Efficiency Plan!*

More efficient packaging machinery is just one feature of the 5-Star Plan. Yet it has helped over 100 companies lower their multiwall bagging and handling costs. All within the last two years!

A midwest packer—by following recommendations made by UNION-CAMP packaging engineers—speeded his bagging rates and saved $48,500. A southern multiwall user now enjoys similar economies. As a result of a 5-Star Plan survey, he installed a UNION I & C Bagger. The new unit cut his labor expense 60 per cent.

For many other firms, installing automatic I & C Acto-Cutters on bagger sewing heads has reduced bagging crews by as much as a third.

The 5-Star Plan offers you impressive money-saving opportunities regardless of the size of your operation. Besides packaging machinery this comprehensive service covers bag design, bag construction, specifications control and a detailed survey of your plant.

And it's free!

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MULTIWALL BAGS

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★ BAG DESIGN · BAG CONSTRUCTION · SPECIFICATIONS CONTROL · PACKAGING MACHINERY · PLANT SURVEY

Southern Weed Conference Officers For 1960

V. S. Searcy (left) of Auburn University, retiring president of the Southern Weed Conference, greets the 1960 officers. They are (left to right): Dr. R. A. Darrow, Texas A&M College, College Station, president; Dr. Walter K. Porter Jr., Louisiana State University, Baton Rouge, vice president; and Dr. R.E. Frans, University of Arkansas, Fayetteville, re-elected secretary-treasurer.

Heads Bemis Operation

F. G. Bemis Jr., manager of the Bemis Bro. Bag Co. plant in East Pepperell, Mass., has been appointed director of allied operations for the company. He is succeeded at East Pepperell by Walter I. Rogers, who had been assistant to the manager.

As director of allied operations, Mr. Bemis is located at the general offices in Boston and is responsible for the operations of the company's Visinet Mill, paper specialty, and plastic packaging plants.

•

Smith-Douglass Names Evans

James C. Evans has been appointed assistant sales manager to direct sales training and development in Michigan, Ohio, and Indiana for the Smith-Douglass Co., Norfolk, Va.

•

Canada Fertilizers To India

Under the 1959-60 Colombo Plan Program, Canada has agreed to make available to India $25 million, which will be used to provide Canadian commodities and equipment requested by the Indian government to help carry forward its second five-year development plan.

Among the products involved, are $2.55 million worth of fertilizers.

•

Davison Granular Fertilizer

Granulated diammonium phosphate (16-48-0) has been added to the Davison line of agricultural chemicals by W. R. Grace & Co., Davison Chemical Division.

Production of diammonium phosphate is under way at the Davison triple superphosphate plant at Bartow, Fla.

•

Monsanto Shifts Area Office

Monsanto Chemical Co.'s organic chemicals division has transferred its agricultural chemicals headquarters for the north central area from Des Moines, Iowa, to Kansas City, Mo.

Robert L. Olcott is sales supervisor for the area. Sales responsibilities for Iowa and eastern Nebraska have been taken over by A. Dale McConathy, who is located in Des Moines.

•

Marathon Dispersant Plant

The Marathon Division of American Can Co. is installing a 100,000 pounds per day spray drier and other equipment for the production of lignosulfonates from spent sulfite liquor at its Green Bay, Wisc. pulp and paper mill. The dispersants can be used for pesticide wettable powders.

•

Armour Advertising Up

Armour Agricultural Chemical Co., Atlanta, Ga., is conducting the largest advertising campaign in its history to promote Armour plant food brands, including Vertagreen for home and garden use and commercial Vertagreen and Big Crop for Farmers.

The company plans to run more advertisements in more publications than ever before. Included are such magazines as *Look* and *The Saturday Evening Post*, many leading farm publications, and daily newspapers. Also, Armour ads will appear on radio and television.

•

Climax Test Marketing

A test marketing program aimed at soybean farmers has been launched by the Climax Molybdenum Co., New York, for its Moly-Gro seed treatment compound. The program covers some 50 counties in Missouri and Illinois.

•

Cyanamid Dealer Contest

Kermit O. Pike, manager of the Martin Elevator Co., Martin, Mich., was awarded first prize in the American Cyanamid Co.'s "Haymaker Contest" for fertilizer dealers in the northeast. More than 500 dealers participated in the contest. Contestants were asked to figure the number of extra days a cow can be carried on an acre of urea-fertilized grass. Mr. Pike's winning answer was 201 days.

•

Test Marketing Herbicide

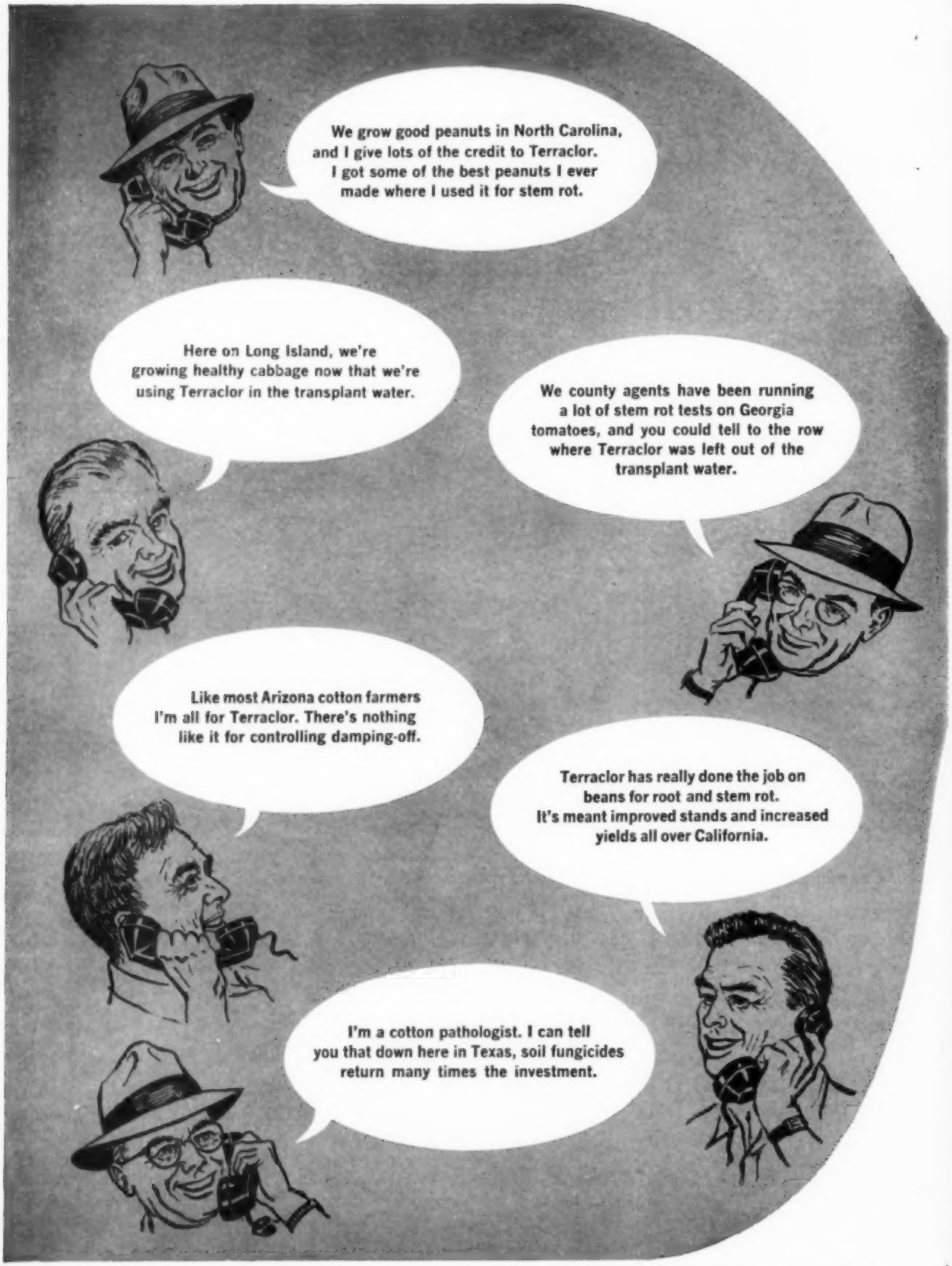
The Dow Chemical Co., Midland, Mich., has begun a limited test market program for a new herbicide in a few cities of the central and eastern states. The product, Dow Crabgrass Killer, contains Zytron, a non-arsenical compound, and is in granular form.

•

California Fertilizer Conf.

The eighth annual California Fertilizer Conference will be held April 11 and 12 at Fresno State College, Fresno. The conference is sponsored by the Soil Improvement Committee of the California Fertilizer Association.

Although details have not been announced, the program is being developed around a theme of "Phosphate Fertilization." A panel discussion will cover legume fertilization and Robert Z. Rollins, California Bureau of Chemistry, Sacramento, will discuss problems as seen by his office.


We grow good peanuts in North Carolina, and I give lots of the credit to Terraclor. I got some of the best peanuts I ever made where I used it for stem rot.
Here on Long Island, we're growing healthy cabbage now that we're using Terraclor in the transplant water.
We county agents have been running a lot of stem rot tests on Georgia tomatoes, and you could tell to the row where Terraclor was left out of the transplant water.
Like most Arizona cotton farmers I'm all for Terraclor. There's nothing like it for controlling damping-off.
Terraclor has really done the job on beans for root and stem rot. It's meant improved stands and increased yields all over California.
I'm a cotton pathologist. I can tell you that down here in Texas, soil fungicides return many times the investment.

Men who know are saying...

Terraclor®

SOIL FUNGICIDE

Gives protection, bigger yields, greater profits

Terraclor pays off on:

COTTON: 25-30% of total disease losses are caused by seedling diseases. Replanting costs $5-15.00 per acre, plus loss of pre-emergence herbicide previously used. Terraclor may increase yields and return the grower more than 15 times his investment through uniform stands of better grade cotton.

CABBAGE, CAULIFLOWER: Severe club root infection can take a field out of crucifer production entirely. Terraclor control has provided 3-5 ton per acre increases for a return of 10-30 times the investment. Terraclor also controls black root or wire stem.

PEANUTS: Faced with the threat of a 50-60% crop loss, growers can realize Terraclor-increased yields of as high as 350-500 lbs. per acre of clean peanuts – free from soil. This return is many times the cost of the chemical invested for control of stem and root rot (Southern blight).

BEANS: Root and stem rot losses run as high as 30-40%. Terraclor may increase yields by 200-300 lbs. per acre and return growers 10-15 times the cost of treatment. Terraclor also controls white mold.

TOMATOES, PEPPERS: Stem rot (Southern blight) can cut production 30-60%, depending on severity. Terraclor treatment can return 10-20 times the investment by increasing yields ⅓ to ½.

LETTUCE: Growers have lost 25-50% of their crop to leaf drop and bottom rot. Terraclor may increase yields by ½ for a profit far exceeding the chemical cost.

Also:

POTATOES ..... (Scab, Rhizoctonia)
WHEAT SEED ..... (Common Smut or Bunt)
GARLIC ..... (White Rot)
ALFALFA, CLOVER ..... (Crown Rot)

FORMULATORS — Get complete information on Terraclor for control of soil-borne diseases. Terraclor is available as 75% wettable powder, 2-lb. emulsifiable, and dust formulations. Call or write today.

OLIN MATHIESON CHEMICAL CORPORATION
INSECTICIDE PRODUCTS DEPARTMENT
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New in '60-better bag service from St.Regis!

All the bags you need!

Now the Bag Division of St. Regis offers you *fast* delivery of bags on a local or national basis to meet your peak season requirements. From thirteen bag plants strategically located in the major marketing areas, St. Regis can now supply you with a complete line of the finest bags made—Multiwall, Textile, and WPPL—delivered *when* and *where* you need them.

This new, expanded service is part of our "Packaging-in-Depth" program

When and where you need them!

designed to serve *you*, the bag user, better than ever before. Besides the thirteen bag manufacturing plants, it includes thirty-three sales offices throughout the country for fully integrated sales and service to meet both your domestic and export bag shipping requirements.

See what a difference fully unified St. Regis sales and service can make. Call your nearest Bag Division man today!

BAG DIVISION **St.Regis** PAPER COMPANY

LONE STAR BAG DIVISION • LUBBOCK BAG DIVISION • WAGNER BAG COMPANY, INC.
CHEMICAL PACKAGING COMPANY • MID-AMERICA BAG DIVISION

Union Carbide Offers Lime

A by-product of Union Carbide's electric furnaces for production of steel and other metals, contains a high percentage of dicalcium silicate. The material has been tested by agricultural agencies, and found to contain 15% greater calcium equivalent than crushed limestone. Union Carbide Metals Co., division of Union Carbide Corp., New York, is offering the product as a liming material to registered land liming companies. It is produced at two UCM plants: Alloy, W.Va., and Niagara Falls, N.Y.

In addition to the dicalcium silicate content of the material, Union Carbide is investigating several of the oxide aggregates for trace element content.

•

Compendium of Plant Diseases

Published by Rohm & Haas Co., Philadelphia. 264 pages. 125 color plates. 9¼ x 6¼. $3.00.

The purpose of this volume, which incidentally represents the first time such a well illustrated text of this nature has been published in the United States, is to show distinctive symptoms of the most important or unusual diseases of the widely known crop plants. Since the recognition of symptoms is such an important preliminary step in diagnosing plant diseases, it was believed that such a collection of illustrations of important crop plant diseases would be an important contribution to agriculture, and would greatly aid their successful treatment.

The book is broken down into four major sections, treating with diseases of: vegetables; fruits and nuts; field crops; and specialty crops. The diseases selected (which include the various rusts, rots, blights, mildews, mosaics, yellows, leaf spots, scabs, smuts, etc.) are representative of the major causal agents: bacteria, fungi, viruses and nematodes. The full color illustrations are exceptionally well printed and show clearly a wide variety of important plant diseases. Descriptive text accompanying the pictures reviews diagnostic symptoms, and discusses distribution of the disease, its economic importance and suggested general control measures.

The publishers have placed a nominal price of $3.00 a copy on this volume, which is certainly very modest in relation to its obvious value to those concerned with plant disease recognition and control. Orders may be sent direct to Rohm & Haas Co., Philadelphia, Pa., att: T. M. Cordero.

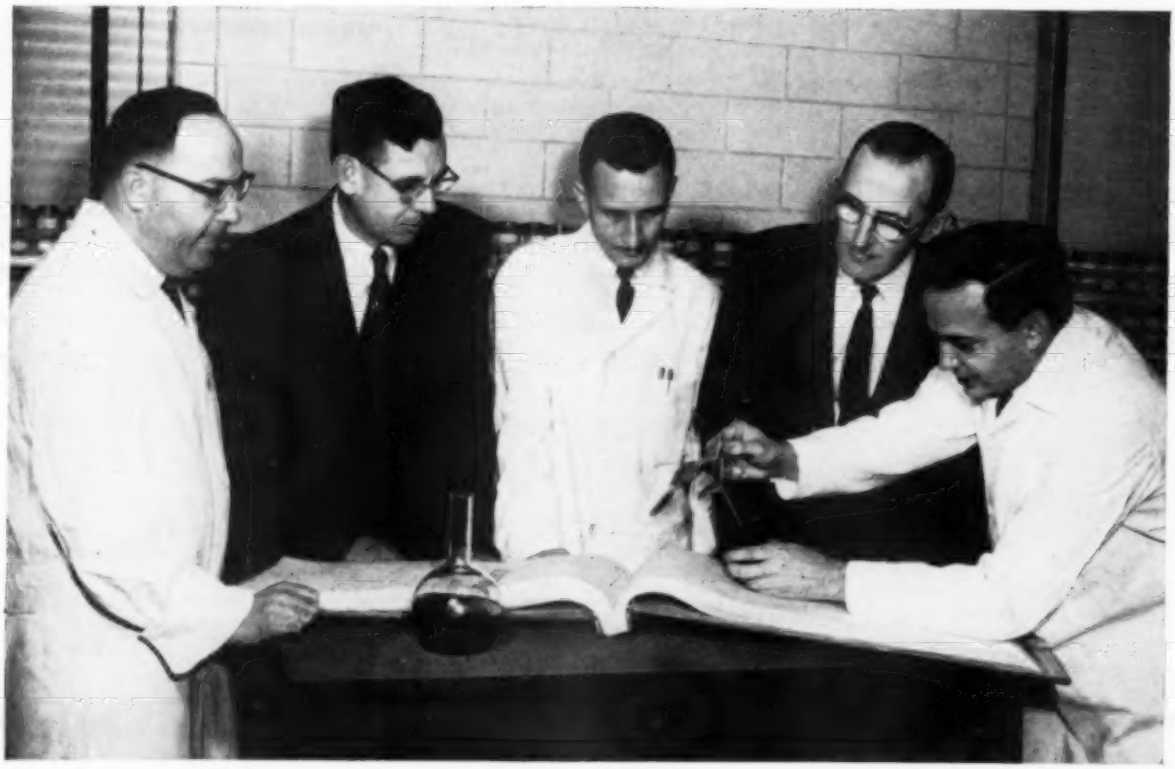
Althaus Joins Monsanto

Ralph E. Althaus has joined Monsanto Chemical Co.'s organic chemicals division as a project manager in the agricultural chemicals section.

•

CFCA To Add New Unit

The Cooperative Farm Chemicals Association, Lawrence, Kans., plans to build a 100-tons-a-day ammonia unit and an addition to the urea nitrate unit at its nitrogen fertilizer plant in Lawrence.



(Discussing promising new insecticide compounds at Hercules' Agricultural Chemicals Laboratory are: George Buntin, discoverer of toxaphene; Dr. E. N. Woodbury, laboratory supervisor; Dr. Keith D. Ihde, research entomologist; Dr. Arthur D. Lohr, supervisor, Naval Stores research; and Dr. William R. Diveley, a discoverer of Delnav.)

Hercules Research:

KEY TO TOXAPHENE'S OUTSTANDING RECORD OF SERVICE

Toxaphene has had a remarkable history. In a fast-moving industry this versatile insecticide maintains its leadership after more than 12 years of service to agriculture. New uses are being found for toxaphene each year as it continues its dynamic growth.

Continuous research is carried on by Hercules Powder Company to find new chemicals for agriculture, and to find better ways to utilize the tools now available. Many of the people doing this work were engaged in the original development of toxaphene. Besides laboratory research, Hercules has placed great emphasis upon field testing and large-scale demonstrations. From such applied research in cotton insect control, for example, has come information to help farmers get better yields while lowering their production costs.

TOXAPHENE

Agricultural Chemicals Division, Naval Stores Department
HERCULES POWDER COMPANY
Wilmington, Delaware

X660-1

Safety Projects Planned

A fertilizer industry safety handbook and a supervisory safety training project were scheduled for attention in 1960 by the executive committee of the Fertilizer Section, National Safety Council, at the group's meeting Feb. 4 in Lakeland, Fla.

The fertilizer industry handbook is to cover all safety measures needed in a fertilizer plant. Its compilation is under the direction of John E. Smith, safety director of Spencer Chemical Co., Kansas City, Mo. The supervisor training project has been conducted for the past two years and features five regional meetings. The program was sponsored and financed by the National Plant Food Institute.

The next meeting of the executive committee is scheduled to be held on June 9, 1960, at Raleigh, N. C.

•

Organize Western Department

The Niagara Chemical Division of Food Machinery & Chemical Corp. has reorganized its western operations with the formation of a Western Agricultural Department.

The new department, with headquarters in Fresno, Calif., is managed by L. M. Duckworth and is divided into four regions. Its territory is comprised of California, Oregon, Washington, Montana, Utah, Nevada, Colorado, Wyoming, Arizona, Idaho, and New Mexico.

•

Production Superintendent

Charles D. Smith has been appointed production superintendent of Allied Chemical's National Aniline Division plant at Moundsville, West Virginia. Formerly with Allied's Solvay-Process Division, Mr. Smith had been organic section supervisor of that division's plant at Moundsville.

•

Thomas S. Reynolds Dies

Thomas S. Reynolds, co-founder of the Bandini Fertilizer Co., Los Angeles, died at sea last month while returning home from a cruise to the Hawaiian Islands. He was 81 years old. Mr. Reynolds and his son, Byron, founded the fertilizer company in 1927.

•

37th CFA Convention Nov. 13

The 37th annual convention of the California Fertilizer Association will be held at the Hotel del Coronado, Coronado, on Nov. 13 to 15. Frank Scoville, Wilbur-Ellis Co., San Diego, is chairman of the program committee.

First Arizona PCO Conference

The first University of Arizona Pest Control Conf. was held Jan. 22 and 23 at Tucson. Among the speakers were: J. J. Davis, Purdue University, who discussed the principles of pest control; J. E. Bussart, Velsicol Chemical Corp., Chicago, who talked on termite control; and J. M. Hill, Dow Chemical Co., Midland, Mich., who advised the operators about the safe handling of fumigants.

You kill all this Russian Knapweed with sodium chlorate today . . .

And a year from now the area will still look like this.

How to kill most any weed the same way

All you need is Oldbury® sodium chlorate to clear any area completely of weeds.

It costs about 25¢ per hundred square feet of area. No expensive equipment is required.

Hooker agronomists will help you set up weed control plots and show you how to store and handle sodium chlorate.

You get fast delivery on the sodium chlorate from the Hooker plants in Niagara Falls, N. Y. and Columbus, Miss. It's 99% pure.

Write for descriptive bulletin. For those interested in defoliating cotton or clearing railroad rights-of-way, we will be glad to refer you to formulators or specialists in these applications.

HOOKER CHEMICAL CORPORATION

603 Buffalo Avenue, Niagara Falls, N. Y.

HOOKER CHEMICALS PLASTICS

Sales Offices: Chicago, Ill.; Detroit, Mich.; Los Angeles, Calif.; New York, N. Y.; Niagara Falls, N. Y.; Philadelphia, Pa.; Tacoma, Wash.; Worcester, Mass. *In Canada:* Hooker Chemicals Limited, North Vancouver, B. C.

Stepan Advances Two

Dr. David B. Hatcher, formerly vice president and general manager of Stepan Chemical Co., Chicago, has been named executive vice president of the company. At the same time, Wilfred J. Crepeau, formerly assistant general manager, was named assistant to the executive vice president.

•

Southwest Potash Moves

The Southwest Potash Corporation has moved its New York offices to Rockefeller Center in midtown Manhattan. The new address is 1270 Avenue of the Americas, New York 20.

•

Heads Portland Branch

James W. Wells Jr. has been named manager of the Chase Bag Co.'s Portland, Ore., branch. He joined the company in 1939 and has been sales manager for the territory since 1948.

•

Joins Bradley & Baker

Thomas Collins has joined Bradley & Baker's Atlanta, Ga., office as a fertilizer sales representative. He will call on customers in Florida.

•

W. Wallace Roff Dies

W. Wallace Roff, vice president and director of Whittaker, Clark & Daniels, died recently in West Orange, N. J. He was 57 years old.

•

Pennsalt And Olin In Deal

The Pennsalt Chemicals Corp., Philadelphia, and Olin Mathieson Chemical Corp., Baltimore, have formed a joint subsidiary to be known as Penn-Olin Chemical Co. The subsidiary will produce sodium chlorate and other chlorate compounds in a plant to be constructed at Calvert City, Ky.

•

C. H. Lilly Names Three

Chas. H. Lilly Co., Seattle, Wash., a corporate affiliate of the Portland Seed Co. and the Inland Seed Co., has appointed three vice presidents; Mal Tellvik, Fenn Emerson, and Ernest E. White.

•

V-C Sales Up, Earnings Down

The Virginia-Carolina Chemical Corp., Richmond, Va., has reported higher sales but decreased earnings for the six months ended Dec. 31. Sales were $24.74 million, up from $23.77 million in the corresponding 1958 period. The company reported a net loss, however, of $13,190, compared with a profit of $169,980 a year earlier.

Flavor Patent To Evans

U. S. Patent No. 2,924,521 has been granted to Evans Research and Development Corp., New York, for a flavor enzyme process to enhance the natural fresh flavor in processed foods. The flavor enzymes are obtained from the fresh food or biologically related materials. Another possibility is that the source may even be waste products such as bruised or overripe fruit, or inedible parts, such as stalks, leaves, or skin.

Yale tractor shovels

are setting new performance standards wherever they are used. Compare Yale power against any other in its field. Only Yale gives you a torque converter and fully automatic transmission with a 72-hp. 6-cylinder engine. Compare Yale action! 2500-lb. carry capacity bucket. Exclusive 45° bucket tipback for faster loading and minimum spillage. 6 ft. dumping clearance—highest in the field. Compare Yale safety! Safety-curve lifting members never rise alongside the operator. Front and rear working lights for additional security. Compare Yale design! Rugged, simplified, more efficient. Brakes and electrical system sealed. 10-ply tires. Many parts interchangeable with Yale Gas trucks. Compare these features with a demonstration in your own plant. See why you'll save time and money.

For full information, or a demonstration, call your Yale representative, or send for free brochure #5255A to The Yale & Towne Mfg. Co., Materials Handling Div., Philadelphia 15, Pa., Dept. YT-4.

Yale Materials Handling Division, a division of The Yale & Towne Mfg. Co. Manufacturing Plants: Phila., Pa., San Leandro, Calif., Forrest City, Ark. Products: Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks · Worksavers · Warehousers · Hand Trucks · Industrial Tractor Shovels · Hand, Air and Electric Hoists

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INDUSTRIAL LIFT TRUCKS
TRACTOR SHOVELS · HOISTS

YALE & TOWNE

Wisconsin Pesticide Committee

Governor Gaylord Nelson of Wisconsin has named a committee of scientists, doctors, and farm authorities to develop a consistent policy on the use of chemicals as feed supplements, food additives, pesticides, herbicides, and growth regulators.

Heading the committee is Dr. Conrad A. Elvehjem, president of the University of Wisconsin. Among others on the committee are: Dr. John Z. Bowers, dean of the UW medical school; Dr. Robert Parkin, assistant to Dr. Bowers; Dr. James Miller, professor of oncology at the McCardle research institute and the UW cancer research laboratory; Dr. William B. Hildebrand, president of the state medical society; and Dr. Henry T. Scott, director of biological laboratories, Wisconsin Alumni Research Foundation.

Governor Nelson said that the committee would seek responsible answers to public health and welfare questions raised by the increasing use of chemicals and durgs in preparation and preservation of foods. Public policy in this general area, has not been clear and consistent, exposing the industries concerned to serious economic hazards.

There is an urgent need to formulate a public policy, he continued, which is clear, consistent and decisive. Governor Nelson said that full account must be taken of the effects upon the public health and welfare, soil and water contamination, and wildlife conservation, as well as the economic aspects. In the light of the uncertainty and confusion that now prevails, he said, it is important that we evaluate the tests, conclusions and procedures that were involved in the cranberry problem. We should indentify the scope of the over-all problem created by the use of chemicals, the governor concluded, and we should carefully analyze and weigh any danger, or potential danger, to human health and wildlife.

The National Agricultural Chemicals Association has offered its full cooperation to the committee.

•

Chemicals Price Rise Likely

Prices of chemicals, which have been sliding for five years, are expected to rise this year, according to the *Wall Street Journal*, which reported that the first sprinkling of price increases went on the books at the first of this year. There were 24 price increases against 10 price declines, the report said, and the hikes covered such volume chemicals as ammonia fertilizers, benzene, sodium hydrosulfite, and wood rosin.

It is expected that prices of chlorine, caustic soda, and soda ash also will be raised shortly. Exceptions to the trend are some of the newer chemicals, which probably will continue to decline as more new producers enter the field.

The reason for the rise in prices was said to be that producers have "just about run out of

cost-cutting technology." Many producers have been able to push their plant's output beyond limits previously considered possible, but, the *Journal* points out, the older the plant, the less effective "debottlenecking" becomes as a means of boosting capacity cheaply. In addition, the cost of duplicating chemical plant capacity is roughly two and a half times the cost of a decade ago.

In addition, there seems to be a better balance between the chemical industry's capacity and demand than for several years back, the report said. One authority was quoted as saying that the chemical industry will operate at about 85 per cent of capacity through 1960. This would be above the estimated 75 to 80 per cent operating rate of 1959 and, also, is well above the 72 per cent figure for 1958. This, of course, gives producers greater latitude in raising prices.

•

1959 Carryover Stocks Lower

Carryover stocks of many leading pesticides on Sept. 30, 1959, were lower than on the same date in 1958, according to a report prepared by the U. S. Department of Agriculture.

The Department's report, based on an annual survey conducted in cooperation with the National Agricultural Chemicals Association, indicates that benzene hexachloride, calcium arsenate, 2,4-D, 2,4,5-T, organic phosphorus insecticides as a group, and copper fungicides were from 27 to 53 per cent down at the end of the 1959 growing season from the same time in 1958.

DDT was in somewhat larger supply, perhaps in anticipation of heavy exports scheduled for the world malaria eradication program. Stocks of grain and soil fumigants, lead arsenate, and most of the chlorinated hydrocarbon group, also were larger than in 1958 as were stocks of many newly developed fungicides, weed killers, and organic phosphorus insecticides. Carryover of these latter materials was sufficiently great that total stocks of pesticides (including prepared mixtures) were about the same as at the end of the previous year.

Although the proportion of particular pesticides carried over as prepared mixtures varied greatly, about 38 per cent of total stocks in both years was in this form.

Inventory changes between September 1958 and September 1959, in terms of percentages, were as follows:

Manufacturers' Stocks of Unmixed Pesticidal Chemicals September 30, 1959

Material	1959 stocks as a percentage of 1958 stocks
Aldrin, chlordane, dieldrin, endrin, heptachlor, toxaphene	144
Benzene hexachloride (gamma basis)	54
10-25 percent gamma grades	48
36 percent and above, including lindane	62
Calcium arsenate	60
Copper fungicides	83
2,4-D (acid basis; includes producers' formulations)	47
DDT	144
Fumigants (grain and soil; includes mixtures)	121
Lead arsenate	149
Miticides (miscellaneous)	127
Organic phosphorus insecticides	65
Includes: Methyl parathion	43
Parathion	121
Others	362
2,4,5-T (acid basis; includes producers' formulations)	79
Fungicides (miscellaneous)	115
Insecticides (miscellaneous)	64
Weed killers (miscellaneous organic)	259

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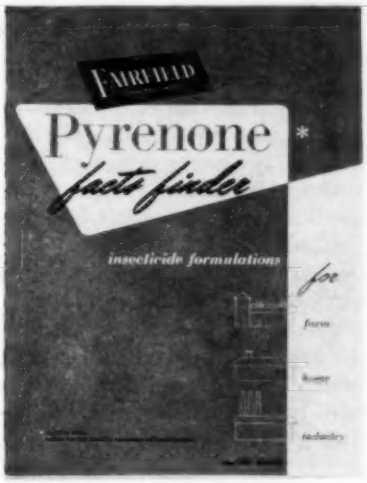

Pyrenone Formulation Aid

A NEW Pyrenone "Facts Finder," a 20-page guide for manufacturers, insecticide formulators, pest control operators, and entomologists, has been prepared by Fairfield Chemicals, Food Machinery and Chemical Corp., New York. Complete with a unique revolving calculator, insect identification table, formulary data, and performance charts, the new guide identifies and describes 33 insects and pests commonly encountered in home, industry, and farm situations.

The disc calculator gives specifications for Fairfield concentrates, and also provides the percentage by weight of pyrethrins and piperonyl butoxide when 12 different Pyrenone concentrates, and five other concentrates are diluted in ranges from 0.1% to 20.0%.

Pyrenone liquid spray performance is described by performance charts summarizing years of laboratory Peet-Grady testing that show insecticide performance of Pyrenone concentrates at various dilution levels.

Included are suggested sprays and emulsions for the home, garden, factory, livestock, grain, storage, and food processing plants. Formulations include Pydenone, Fairfield combination of pyrethrins and the synergist, piperonyl butoxide. The toxicant is recommended for use against resistant insects and around foods, meat and dairy animals.

Insect resistance is covered with a report of Fairfield's national survey of housefly and roach resistance. The first national survey of its kind, the report includes maps showing a state by state picture, and suggested formulae for resistant insect control.

Designed for use as a day-to-day technical and informative tool for formulators and others working in the field of insect control, the "Facts Finder" is priced at one dollar. Copies may be obtained from the company at 441 Lexington Avenue, New York 17, N. Y.

•

Plastic-Handled Bag

The St. Regis Paper Co., New York, has developed a sewn multiwall bag that features an injection-molded polyethyene handle. The bags, which require no special handling, currently are being used by the Watkins Salt Company, Watkins Glen, N.Y., for 25-pound consumer packages of granulated salt.

•

Geigy Surfactants Booklet

Geigy Industrial Chemicals, division of Geigy Chemical Corp., Ardsley, N. Y., is offering an eight-page bulletin, "Geigy Surfactants", that contains information on physical properties and end uses.

•

New Batch-Weighing System

A new bulk-materials batch-weighing system for use in multi-ingredient product formulation is being offered by Weighing & Control Components, Inc., Hatboro, Pa. Detailed information is available from the company at 643 East County Line Road, Hatboro.

•

Process Co. Emulsifiers

Process Chemical Co., Santa Fe Springs, Calif., is offering emulsifiers that contain no metallic ions, no ash, and no water. Tradenamed Protox, most of the emulsifiers consist of balanced combinations of non-ionic and anionic surfactants, although some of the Protox surfactants are completely nonionic.

Laboratory and field tests on stability and performance have

been in progress under a wide variety of conditions in Arizona, California, Washington, Oregon, and Canada and there have been no reports of breakdown of either the surfactants or of the pesticides.

•

O-I Plastic Shipping Sack

Owens-Illinois Glass Co., Toledo, Ohio, will begin production this year of a heavy duty plastic shipping sack for agricultural and industrial products.

Stronger Polyethylene Bag

Phillips Chemical Co., Bartlesville, Owla., has developed a tailored plastic resin, called Marlex TR-101, thtat produces a film with a burst strength that reportedly is superior to conventional polyethylene or kraft multiwall bags.

Seven mil bags of Marlax TR-101 have demonstrated a burst strength 2½ times that of 10 mil conventional polyethylene, 38 per cent more tensile strength, and more than 25 per cent improved moisture barrier. In tests, cross-country shipments of over 10,000 filled bags showed a breakage record of less than a half of 1 per cent. The film can be produced in white or a variety of colors.

•

Elastomeric Spray Mulch

Alco Oil & Chemical Corp., Philadelphia, has introduced an elastomeric polymer emulsion for use as a spray mulch along highways and landscapes to control soil erosion and speed seed germination. The product, named Vulcanol, is said to be particularly useful for graded areas and sloped terrain.

Vulcanol can be applied with standard spray equipment. It forms a web-like porous, non-water soluble coating on the soil surface and stays in place long enough for grass seed to germinate. A booklet describing the product is available from the company at Trenton Avenue and William Street, Philadelphia 34, Pa.

•

Sweco Technical Data

A technical data folder on the Sweco Vibro-Energy Mill has been prepared by the Southwestern Engineering Co., Los Angeles.

Included in the folder is a booklet on "High Frequency Impact Grinding and its Application in the Vibro-Energy Mill" by Henry L. Podmore of W. Podmore & Sons, Ltd., Stoke-on-Trent, England.

•

Schelm Brothers Catalog

Schelm Brothers Inc., East Peoria, Ill., has issued a catalog describing its line of liquid fertilizer tanks and application equipment.

•

Laboratory Cage Washer

A stainless steel laboratory cage washer, developed to clean and sterilize cages used for housing laboratory test animals, is being offered by the Ransohoff Co., Hamilton, Ohio.

The machine washes and drains the cages, then subjects them to a sterilizing steam spray.

COOP TAX CASE

(*From Page* 81)

however, because it does not got far enough.

Mr. Horne, who was speaking as a member of the Manufacturing Chemists' Association's tax policy committee, said that the core of the problem is the patronage dividend. Some co-ops pay these dividends in cash but many just give their members certificates stating that a certain amount of the net margin has been allocated to their accounts. Under the law, patronage dividends allocated by a cooperative are deducted from its gross income before a tax computation is made. This is done, Mr. Horne said, whether or not the dividends actually are distributed. As a result, he continued, cooperatives can accumulate large amounts of equity capital tax-free.

In 1958, Mr. Horne pointed out, 22 per cent of the total fertilizer sales in the U. S. were handled through cooperatives. In addition to bulk blending plants, co-ops own over 100 large scale plants to produce chemical fertilizers. Some co-ops have plants producing the basic chemicals used as raw materials for fertilizers, and some are mining raw materials such as phosphate and potash. Thus, Mr. Horne declared, cooperatives compete with taxpaying companies in businesses which are substantially unrelated to the original functions of cooperatives.

Mr. Horne recommended that the tax laws be amended to forbid deductions for patronage dividends to the extent such dividends are derived from unrelated business income; and, forbid deductions for any remaining patronage dividends unless these dividends are distributed in cash.

Mr. Coleman of Allied Chemical told the committee that the chemical industry has no quarrel with tax exemptions on income of cooperatives derived from their classical functions. But all who compete in any line of business should compete under the same rules.

The president of the National Council of Farmer Cooperatives, George B. Blair, said that earnings of farmer cooperatives should be taxed only once, either in the hands of the cooperative or the patron.

CALIF. CONFERENCE

(*From Page* 83)

tests on the corn earworm have shown that Sevin or Malathion dusted on the silks of sweet corn are as effective as is DDT.

Dr. W. H. Ewart, entomologist, told conferees that none of the several new insecticides tested in 1959 for citrus thrips control was superior to standard treatments now being used. Delnav, he said, which has a low toxicity to honey bees, continues to show promise in groves where it is desirable to make applications while bees are working blossoms.

PEST ROUNDUP

(*From Page* 69)

bugs, however, seemed to be on a slight increase in Oklahoma by the latter part of the month. Approximately one-half of the small grain checked in the east central area of Oklahoma was found infested. The majority of the infested fields were in the Arkansas river bottoms, where counts ranged from 2 to 25 per linear foot, with an average of 9. Greenbug counts in Arkansas, Kansas, and Texas were generally very low.

In Oklahoma, counts of the spotted alfalfa aphid averaged 50 per linear foot in fields checked in Roger Mills County, 100 in Custer County and 2 per linear foot in Jackson County. Counts of 1,000 plus per square foot were found in a few isolated fields of old alfalfa in the Hennessey area of Kingfisher County, Oklahoma.

Among the vegetable insects, the cabbage looper in the lower Rio Grande Valley of Texas appeared troublesome, causing damage to lettuce in some areas.★★

TRADE ASSOCIATIONS

(*From Page 45*)

our educational conferences and through them has gained the good will and respect of official entomologists, including regulatory, research, extension and teaching authorities, thus giving much prestige to the industry. The annual conventions and sponsored conferences have provided a necessary medium for the exchange of knowledge, ideas, and experiences of mutual interest.

The Association has provided scholarships and fellowships, and otherwise sponsored and promoted research and education on pest control problems; also it has been largely responsible for inaugurating 4-year college curricula in industrial pest control and providing sources of information essential to the industry.

Not only has the Association raised the standards of pest control but in addition has obtained recognition and representation on important industrial and scientific bodies, as BRAB and other committees of the U. S. Department of Agriculture and the U. S. Department of the Interior.

The Association has assisted the industry with the important problems of legislation. It has maintained a technical service to evaluate new developments, technical materials and methods, and made such findings available to the membership; also it has advised members on their own pest control problems. Individual operators or organizations are seldom able to have their own technical specialists, such as the Association is able to provide.

As examples of Association service, it should be noted that many invaluable publications are offered. These include sets of Kodachrome slides and films as well as regular service letters and valuable technical releases.

Besides these tangible values of Association membership, there are also those intangible values which we so often forget. The conferences and conventions sponsored by the Association have developed wide acquaintances, friendships, cooperation, helpfulness and interest, among those attending, one with another. What a wonderful *esprit de corps* and a thrill seeing old members and making new friends at these meetings. And by no means least is the ever ready helpfulness from the Association's technical service. I am sure every member has a personal satisfaction in knowing he is building an industry association, and that through the Association he has been able to help in setting ethical standards for the conduct of his business.

The dues required to finance all of these tangible and intangible activities are an investment which return interest many fold. In addition, as members we have other ob-

ligations beyond our monetary support of the organization, that of being active, helping the Association grow, and helping the Association to be better recognized.

As one member of several years told us, "Most of all, I look back upon the lowly beginning of the Association, with its secret formulae and small men and outfits, to see the growth of new ideas, new equipment, new materials, educated and ethical operators, and a continued growth of the Association, but above all the many new friendships and associations beneficial to all."

Remember the slogan, *"United We Stand,"* think of the impact of Unions on our economy, and you will realize the importance of organization and the slogan, *One For All and All for One.*

WITCH WEED

(From Page 44)

spraying adjoining wooded areas and around fences with 2,4-D. In addition, several thousand acres of roadsides and wasteland were sprayed with herbicides. Results of these field tests indicated that an eradication program based upon cultural and chemical means available would be practical.

Congress provided the necessary funds for the fiscal year 1959 to inaugurate a cooperative undertaking by the U. S. Department of Agriculture, agricultural agencies of the two states and farmers in the infested area. The farms involved are generally small in size. The principal crop rotation is corn, tobacco, and cotton, with small grain alternating with both corn and cotton. The value of the farm is often determined by the number of acres of tobacco allotted.

The plan for the 1959 season was similar to the program in 1958, but was considerably larger and called for the cooperation of 1,400 farmers in the growing of catch crops on 15,900 acres. Farmers involved signed agreements to withdraw infested fields from production. They agreed to prepare the soil, plant the corp, and plow it under at the time designated by representatives of the witch weed control program. Corn, sorghum, and oats were used as catch crops on the infested fields. Corn was planted in the spring as the first catch crop. This was followed by sorghum, and finally oats. The corn and sorghum were plowed under when the witchweed first appeared above the ground. Oats were used as a winter cover crop, and any witchweed appearing above ground was killed by the first frost.

The herbicide program started with the appearance of the first wicthweed in early June 1959, and was carried out on 58,945 acres involving about 6,000 farms in 22 counties in the two states. The farmers involved in the herbicide programs were encouraged to plant corn on the more heavily-infested fields. On cotton and tobacco land and other fields that might be infested with witchweed and on which herbicides could not be used, it was necessary to cultivate the fields frequently to prevent witchweed from going to seed after its growth was stimulated by crab grass. Farmers having witchweed-infested land were most cooperative and glad to avail themselves of the herbicide program.

It was recognized that the utmost care would be required to avoid serious herbicide damage to crops. By careful planning and execution of the program, it was possible to treat thousands of acres successfully without material damage to crops.

It was also recognized from the outset that it would be necessary to repeat the operation on each field during the growing season. By the end of June, all fields except those in the cultural program had received one application of herbicide. The treatment program continued with each field

receiving a herbicide application at 2-week intervals. When survey crews detected new infestations, treatment was promptly applied.

As the tobacco crop was moved off the fields in August, jeep-mounted spray rigs were brought in and spray treatments were begun to keep witchweed from going to seed on crabgrass. A total of 35 high-clearance tractor sprayers were used to treat cornfields and 30 jeep-mounted boom sprayers were used on wastelands, roadsides, and uncultivated lands. In fields in which high-clearance tractor sprayers could not operate, laborers using back-pack hand sprayers were employed to keep the witchweed down.

Supplying spray crews with chemicals and materials required 188 supply trailers, tanks, and service vehicles. In addition, five 1½ ton trucks were used to transport heavy equipment from one location to another. When the program ended early in November 1959, over 60,500 gallons of 2,4-D had been applied to 232,470 acres of witchweed-infested land.

To support the program, the Crops Research Division and the Plant Pest Control Division of ARS, in cooperation with scientists of the states of North Carolina and South Carolina started several lines of investigation, designed to advance our knowledge and improve methods for use in the eventual eradication of this parasitic weed. A Witchweed Methods Improvement Laboratory was established at Whiteville, North Carolina. Here a team of highly-trained specialists, including agronomists, chemists, and plant physiologists set about developing new or improved methods of killing witchweed seeds before or after germination by the use of chemicals or cultural techniques, evaluating the effectiveness of selected chemicals in controlling witchweed, and studying related aspects of the problem.

A quick victory over witchweed will not be easy. In the short time research scientists have had to study this plant, they have already learned many things about its habits that will aid in the eradication of this parasite. Plans are now being drawn for the 1960 program. As new techniques, new herbicides, and improved equipment and methods are developed, they will be put into use against this menace which strikes at the roots of some of our primary crops.★★

CAAA MEETING

(*From Page* 67)

over, then everybody rushes in at once to shut it off. What we must have is a sensible subsidy program," he said.

"The recent steel strike was played up as largely a blow at the auto industry, yet the U. S. farm industry used more steel in 1959 than the auto industry. Nobody felt sorry for the farmer.

"A full 30 per cent of the nation's population is involved in

some way in growing food or getting it from the farm to the market.

"Today, we have got to do better work, and yet we are running short of experienced pilots and the men we train will be lacking in this vital experience. We are going to need better planes, more and better pilots, and we are going to have to have sensible laws governing our industry and the farm industry".

"The price of security is freedom, and right now we have a million federal, state and local laws, all aimed at just one thing—enforcing the 10 commandments".

Pest Control from the agricultural commissioner's viewpoint, was discussed by Claude M. Finnell, Imperial County Agricultural Commisssioner. Addressing the afternoon technical session, he said:

"Our job of pesticide control starts long before the introduction of the pest into California. The job of legal pest control starts at the border, at the post offices, freight office, bus termnal or at the airport and continues to be a part of our job down to the destruction of the orchard that was abandoned because the farmer can no longer support the bugs.

"In the local pest control field, as in many others, the agricultural commissioner has a prime responsibility in protecting the agricultural industry. This protection actually is an extension of the legal type of pest control mentioned above. It consists of several phases: the immediate extension of quarantine is known as pest detection, that is, the search for pests not known to occur any place in California with the purpose of locating the infection or infestation while it is still small or local; the eradication detection program for pests that are known to exist in California in limited areas and being subjected to eradication measures; and pest survey. The purpose of the survey approach is to ascertain the intensity and damage being done by pests that are established and known to occur generally in California. Pest Survey and pest control enforcement are the two areas most closely allied to the work of this association.

"I would like to raise some question about pilots. I think pilot license examination is fine; however, it may be deficient in the application phase. There should be some way an operator can be sure a pilot knows how to apply the materials he knows where to put. My candid opinion on the apprentice pilot certificate and the way it is being operated is not very favorable." Mr. Finnell concluded.

1959 Safer Than 1958

Bob Bunch, Safety Committee Chairman opened the Friday luncheon meeting with the comment:

"In California in 1959, the industry lost an estimated $600,000 in equipment".

He then introduced R. C. Boone, Flight Operations Specialist, FAA, Los Angeles who cited recent accident figures for the industry. Mr. Boone told the group that in 1959, of 47 accidents involving agricultural aircraft in California, 5 deaths were reported. This compares favorably with the tragic 1958 figure of 16 killed. Mr. Boone said that analysis shows that the same type of accidents persist year after year and that two main causes can be pointed out as responsible:

(1) a desire to beat competition, wherein safety is ignored to get a job away from a competitor.

(2) taking an impossible job just to satisy the ego, or to show up competition, or to prove that nothing is impossible.

"What is responsible for the better record in California last year? Perhaps a little less exposure due to fewer hours in the air, or perhaps due to the initiation of a concerted and organized safety program. An accident investigation team to study aircraft accidents is forming and the FAA has started training courses for investigators."

More Public Relations

Deploring the fact that most people in Washington have no conception of what agricultural avia-

tion is, or the service it renders to the nation, Lloyd Nolen NATA agricultural vice president said that the first step to remedy this situation is to improve the organization's public relations.

"What must be told is this: the value of the airplane to agriculture; the large percentage of total farm chemicals that are applied by airplane; that in many cases the airplane is the only method by which a farm chemical may be applied to save a crop, range or forest from destruction; that the airplane has played a major part in the tremendous increase in per acre yield of many crops; the large number of aircraft and small airplane companies with ability and integrity that serve almost every farming community and provide a necessary service".

The convention closed with a Saturday morning business session at which new officers were elected for the coming year. Reelected to serve the organization are: James K. Vedder, president; Monty Landsiedel, vice president; and Wayland S. Fink, secretary-treasurer.★

ILLINOIS SCHOOL

(*From Page* 61)

counties might have trouble. Other areas might have isolated infestations.

Chinch bugs will probably not be a serious pest unless a drought occurs in June. This may happen in Central Illinois, he concluded.

Face Fly Research

Research results on face flies on cattle were discussed by W. N. Bruch, associate entomologist, Illinois Natural History Survey, who said that face flies caused a considerable amount of concern in the northern half of Illinois during 1959 for the first time. In control experiments, he said, residual insecticidal treatments of the farm premises caused little, if any, significant reduction in these flies.

Application of residual toxicants, such as Toxaphene, DDT, and Malathion, to the entire body surface of cattle temporarily reduced the flies for the first day following application, Mr. Bruce said. Repellent sprays containing R-326 or Tabatrex produced a practical level of control (70 to 90 per cent reduction) for the first 24 hours after the application. Mr. Bruce added that an outstanding reduction in numbers (90 to 98 per cent) was obtained by applying syrup bait to the foreheads of cattle. The most effective baits, he continued, contained 0.2 per cent DDVP, 1 to 2 per cent dimethoate, or a combination of these insecticides. The attractive base of the bait was composed of 75 per cent corn syrup and 25 per cent water. The material was applied with a one-inch paint brush to the animal's forehead.

Mr. Bruce recommended that applications be made daily during the first two weeks of treatment and, from the third week to the end of the fly season, they should be made at intervals of two to five days.

Soybean Defoliation

W. O. Scott, asssociate professor of crop extension, U. of I. Agronomy Department, reported on crop desiccants and said that most of the chemicals available as defoliants or desiccants today were tested in the early 1950's. These include pentachlorophenol, Dow general, sodium cyanamide, potassium cyanate, sodium chloro-borate mixtures, and Endothal. Most of the chemicals that were tested, he said, readily defoliated the soybeans. However, when they were applied early enough to actually hasten drying or maturity of the beans, yields were materially reduced. This, he pointed out, indicated that the date of harvest of weed-free soybeans could not effectively be speeded up by the use of preharvest sprays.

Mr. Scott added, however, that, in years when soybeans are especially weedy, there is renewed interest in desiccants. For instance, he said, in 1959 many requests were re-

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ceived for information on the use of desiccants to increase ease of harvesting. Since the Illinois soybean crop primarily is used for human food and livestock feed, he said, the desiccants that can be used are extremely limited.

Magnesium chlorate is one material cited by Mr. Scott that can be used as a desiccant on food crops. Last fall, he said, the University of Nebraska released a progress report on the use of nitrogen solutions as a sorghum desiccant. Nitrogen solutions that were tested were inferior to magnesium chlorate formulations, however, Mr. Scott said. ★★

SAFE HANDLING

(*From Page* 63)

very poisonous pesticides in common use can of course be absorbed through the skin as readily as they can by being swallowed.

Design of pesticide application rigs should facilitate the complete and easy cleaning of the equipment. Carry-over of small amounts of dusts or sprays from previous jobs has caused many crop losses. It is more or less agreed that, from a practical standpoint, equipment once used for 2,4-D should not be used for applying any other pesticide on a sensitive crop. There have been several cases where operators took heroic precautions to decontaminate such equipment, only to find that enough of the material was left somewhere in the system to cause conspicuous symptoms of injury on subsequently sprayed crops. Even if an operator is certain that he can clean all traces of 2,4-D out of a spray rig, by so doing he is in poor defensive position if symptoms of 2,4-D injury show up on a crop that he treats. Occasionally such symptoms may come from contamination of the pesticide before the operator applied it, but this is difficult for him to prove if the records show that he has previously used 2,4-D in the suspected equipment.

It is possible that overhead sprinklers may solve some of the problems of residue if used shortly before harvest to reduce the dustiness to which workers are exposed and to reduce the pesticide residue on the crop. Some tests to establish the value of this procedure should be well worth while.

Some progress is being made, particularly in foreign countries, to enclose the spray rig operator or the tractor driver in a cab equipped with filtered ventilation. This certainly sounds like a good protective measure. Some work also has been done on the development of ventilated helmets to take the place of bulky respirators.

Inasmuch as drift is one of the most difficult problems facing applicators of pesticides at the present time, it might be very profitable for designers of farm equipment to investigate the possibility of using hoods, shields, and canopies wherever possible to reduce drift of sprays and dusts at the time of application. It is commonly thought that sprays are less likely to drift than dusts. This is not wholly true and a fine spray might cause just as many problems in drift, if not more, than a dust preparation. However, it is clear that coarse agricultural sprays do drift less than the fine dusts used in pesticide formulations and, to this extent, a coarse spray is much safer than a dust. If designers of application equipment could develop spraying apparatus that would provide a more uniform pattern of particle sizes, and eliminate the fine particles, much of the problem of drift would be solved.

The primary concern in the design of equipment for application of pesticides naturally has always been control of the pests, but all this is wasted effort if use of the equipment incurs some overriding liability by injuring workmen, by drift that damages neighboring crops, or by some other unforeseen hazard.★★

FOOD ADDITIVES

(*From Page 41*)

Drug Administration and was put on the markets. Then Food and Drug changed its position and permitted only zero tolerance. . . . The result was that millions of dollars worth of the pesticide has been purchased, and suddenly was limited to nonfood items.

"Fourth. The publicity about minute traces of these chemicals is being greatly exaggerated abroad which may cut our foreign markets and stimulate a Communist propaganda spree concerning U. S. cancer exports.

"Fifth. It is estimated that 40 percent to 50 percent of the increase in U. S. agricultural production since World War II is due to agricultural chemicals. Without these chemicals our production would fall below normal demands.

"Sixth. The unpredictability of Government reaction to new chemicals threatens to shift research from agricultural to other chemicals. This could create a serious health hazard since we use new agricultural chemicals to combat disease because insects build up resistance to existing insecticides. For example, in some areas increasingly heavy doses of DDT are required to kill mosquitoes. We will soon need a new mosquito-killing chemical to keep malaria in check."

MID WEST MEETING

(*From Page 40*)

who take soil samples and interpret soil test recommendations for farmers, it was found in the study, maintain a relatively high markeup over purchase costs—an average of 9.3 percent. They have relatively high gross profit margin on fertilizer, and worry less about competition.

"The day of the order taker is passing out of the picture," the report summed up. "The alternative may be well trained specialists who can give expert advice on farm business and management, on sales and education, as well as information on fertilizer and its use."

ANOTHER FAMOUS 40&8

THE NEW KLM DC-8 JET CARGO SERVICE. The original "40&8" was a French boxcar during World War I. The boys in the A.E.F. knew it as their Pullman to the front. After that ride, it was all on foot, through the mud to the trenches. The "40&8" took its name from the load capacity stencilled on its side . . . 40 Hommes & 8 Chevaux . . . 40 Men & 8 Horses. It was and is the most famous boxcar in history. But now, KLM whose own history dates from World War I, introduces another "40&8," destined to be just as famous in its own right. On its 40th Anniversary, KLM introduces its new **DC-8** Jet Cargo Service, soon ready to carry your products to the selling fronts the world over. It will deliver your shipments in a few hours or overnight to any market on the globe. It will reduce your inventory and handling costs, open up vast marketing areas to increase your profits. For more information on the new KLM "40&8," contact your freight forwarder, cargo agent or KLM, 609 Fifth Avenue, New York 17, N. Y. — PLaza 9-2400.

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Checks must accompany all orders.

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ENTOMOLOGIST — Wants to return to insecticide field. Would prefer laboratory or technical service. Will relocate. Box 269, c/o **Agricultural Chemicals.**

AGRONOMIST, M.S. Tropical Agronomy — Agricultural Chemistry. Experience in Europe and S. E. Asia (agricultural chemicals). Outstanding references. Age 30. Knowledge of Dutch, German, French. Available immediately. Address Box 270, c/o **Agricultural Chemicals.**

MANUFACTURER'S REPRESENTATIVE IN SPANISH AMERICA desires new opportunity. 15 years in Central and South America. Experience in sales management of insecticides sold direct and through distributors. Market research and development. Age 47. Venezuelan citizenship of German origin. Languages: English, Spanish, German. Address Box 271, c/o **Agricultural Chemicals.**

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GERRY E. COOK has been appointed sales-service representative for Tennessee by the Vulcan Steel Container Co., Birmingham, Ala.

EDITORIALS

(*From Page* 29)

so long that perhaps he knows all there is to know about it. But times change, progress is inevitable, and where this attitude is found to exist, fertilizer manufacturers will have to exert themselves to correct it. Perhaps they may have to modify some of their own ideas about the industry as well.

HEPTACHLOR

(*From Page* 40)

plications for reregistration be made by letter, accompanied by duplicate copies of fully corrected labels for each product. This request for reregistration should list the full name of the product and the number under which it was previously registered.

The U.S.D.A. notice reminded registrants that "shipment in interstate commerce of heptachlor formulations bearing labeling which was canceled on January 23, 1960, will be considered in violation of the act . . . Under the provisions of the Act directions for use must accompany the product, but are not required to be printed on the container label."

The U.S.D.A. has approved the accompanying list of uses and has indicated that claims covering such uses will be acceptable on labels submitted for reregistration without further data. They indicate, however, that "should extensive new evidence be developed to question the validity of a specific use . . . it may have to be withdrawn." U.S.D.A. has also clarified its policy on handling other proposed uses of heptachlor by providing that any interested party will be permitted to submit evidence to establish that a use previously accepted based on the tolerance would in fact leave no residue of either heptachlor, or its degradation product, heptachlor epoxide. Upon submission of evidence, such use would evidently also be approved.

Covers North Carolina

An item on page 79 of our February, 1960 issue stated that R. J. Rawls has joined the Planters Chemical Corp., Norfolk, Va., as a salesman in the Washington, D.C. area. Actually Mr. Rawls is headquartered in Washington, North Carolina, and is in charge of pesticide sales in that area.

Techniques for Plant Surveys

A report on "New Techniques for Plant Disease Surveys and for appraisal of Losses" prepared by Paul R. Miller, USDA, appeared in the January 15th issue of the *Plant Disease Reporter*.

The report offers repreesntative examples of the type of investigation that provides bases for estimating or predicting losses. The discussion is organized under three topics: advances in survey methods; fundamental investigations on the spread of pathogens; and assessment of plant disease importance.

•

Dowpon For Peach Orchards

Dowpon has been approved for control of grasses around established peach trees in non-irrigated orchards. The registered spray solution is mixed at the rate of one pound of Dowpon in 20 gallons of water and is applied to wet the grass. Two applications are said to suffice for a season in most cases.

The program has been tested in the Carolinas, Georgia, Ohio, and Michigan by the manufacturer, Dow Chemical Co., Midland, Mich.

•

Carbide Names Two

Two Crag Agricultural Chemicals appointments were announced recently by Union Carbide Chemicals Co., Division of Union Carbide Corp., New York. M. J. Siciliano now is manager, sales services, and J. B. Harry has been named sales manager.

•

Brinton Joins Witco Board

J. Porter Brinton Jr. has been elected a director of the Witco Chemical Co., New York. Mr. Brinton currently is president of Hydrocarbon Products Co. and is chairman of the boards of two recently-acquired Witco subsidiaries; Tar Distilling Co. and Old Colony Tar Co.

•

Lang Heads Stauffer Plant

Edward G. Lang has been appointed manager of Stauffer Chemical Co.'s Hammond, Indiana, plant. He had been assistant superintendent in charge of production of Stauffer's, Houston, Texas, plant.

•

Chase Polyethylene Plant

Chase Bag Co. has established production facilities for converting polyethylene film to bags at its New Orleans Plant. Production is scheduled mainly for the Texas and Florida areas.

•

N. J. Raising Mosquito Funds

A bill to approve a $2,000,000 campaign against mosquitoes in New Jersey has been approved by the Republican majority in the State Senate. The bill will be voted on by the full Senate when it reconvenes March 14.

The bill would provide $1,000,000 in state aid to all 21 counties for mosquito extermination efforts. This is 13 times what the state spent during this fiscal year—$75,000. Each county would have to match any state funds.

•

Todd Named By St. Regis

St. Regis Paper Co., New York, has named John Todd as sales service manager in the Los Angeles, Calif., district of its bag division. He succeeds G. E. Dickinson, who has been transferred to the St. Regis kraft division at Tacoma, Wash.

•

NAC Tolerance Listing

The National Agricultural Chemicals Association, Washington, D. C., in a special issue of its *News and Pesticide Review*, has published a complete list of official FDA pesticide tolerances.

The issue is the sixth in a series of special issues that have been published annually since enactment of the Miller Amendment, and is complete as of Feb. 1, 1960.

•

Illinois Fertilizer Conf.

Research for the future now centers around investigations needed to trigger the "break-through" on present limitations on crop yields, Dr. M. B. Russell, University of Illinois, said Feb. 4 at the Illinois Fertilizer Conference at Champaign.

We need to know more about soil-plant relationships and their effect on the movements of and need for moisture, nutrients, and other factors of plant growth, Dr. Russell noted.

Plans for modernizing techniques in Illinois soil testing laboratories were discussed by James C. Laverty of the UI agronomy department. He suggested a change in the phosphorus test that would result in the measurement of the immediate phosphorus needs of the soil. From the new tests, he said, farmers could get recommendations for applying soluble phosphate on a specific crop. The old phosphorus test gave recommendations for applying such materials as rock phosphate over a three or four year period.

More than 200 fertilizer manufacturers, suppliers, salesmen, and dealers attended the session.

LEFT. Attending the Illinois Fertilizer Conference were the officers of the Illinois Fertilizer Industry Association. They are: (left to right) H. L. Stangel, Darling and Co., East St. Louis, treasurer; J. R. Abbott, Ashkum Fertilizer Co., Ashkum, vice chairman; R. B. Nethery, Federal Chemical Co., Danville, secretary; and R. A. Weis, Virginia-Carolina Chemical Co., East St. Louis, chairman. **RIGHT.** Among others at the meeting were: J. F. Taggart, E. I. DuPont, Danville, Ill., (left); S. R. Aldrich, U. of Illinois, (center); and H. H. Tucker, Sohio Chemical Co., Lima, Ohio.

INDEX to ADVERTISERS

TALE ENDS

WE learned recently that a Market and Economic Survey of Agricultural Pesticides is being undertaken by two industrial consultants, one located in New York and one in London. The survey, it is stated, will be the most comprehensive study of the subject ever undertaken, and will cover the European as well as the American market.

Sample questions to be answered include the following: who are the major producers of pesticides? what is the share of the market each has? what are estimated market totals for 1965, 1970? who are the major consumers? what are their specifications? what new products are in development? how will they affect sales of present products? what are the characteristics of marketing structure, strategy, policies, etc.?

The answers to these and dozens of other questions will be compiled in a report which will sell to subscribers at a figure well up in the thousands of dollars. We're used to the idea of such surveys, for not a week goes by but some advertising agency asks us for similar detailed information about the industry, which they are always surprised that we don't have right at our finger tips. When we read the suggested price tag on this new report, we begin to get an idea of what it would cost us if we tried to answer all these queries.

Anyone interested in subscribing?

AC

Stop the presses! We have finally found a situation where growers are reported to be using "too much" fertilizer. The Maine Agricultural Experiment Station is currently recommending to Maine potato growers that they use less rather than more fertilizer. The recommendations are based partly on retention of applied nutrients in the soil, and partially on indications that potato plants can utilize only so much of the plant food applied. As a result of the change in recommendations by the station last year, Aroostook potato farmers used about 12% less total fertilizer in 1959.

AC

The forgotten man in all the commotion following the famous cranberry incident has been the cranberry grower. The latest report we have is that Ocean Spray Cranberries, Inc. had to lay off one-third its work force after Sec. Flemming pulled the rug from under them. A recent Trendex poll disclosed that three out of four consumers stopped eating cranberries, with the result that the cranberry industry has suffered an immediate loss of twenty million dollars, as well as a curtailment of its market for many years in the future.

AC

There has been a lot of continuing talk,—but not many real facts—about the expected arrival in the United States of a shipment of Russian potash. Your reporter, digging into the subject in search of the facts, found that the ship carrying the potash is scheduled to arrive on the southeast coast of the U. S. in March, and will make stops at both Jacksonville and Norfolk. Whoever is buying the Russian potash,—at a price reported to be well below the regular domestic quotation is not doing much talking,—and we would say the reasons are obvious. H. J. Baker & Co., New York and Joseph Jett in Norfolk are reported acting as brokers in the sale of the Russian potash to American buyers.

Last year there was much talk of a similar shipment which was to have brought Russian potash into the U. S. through the St. Lawrence Waterway, destined for a Great Lakes port. Actually, however, no such shipment ever arrived. There were approximately 55,000 tons of East German muriate of potash, however, which reached the southeast coast, consigned to buyers in Savannah and Norfolk.

AC

Back to school for John Rodda of Fairfield Chemicals. — and a thirteen weeks vacation from selling Pyrenone. John will take the course in Advanced Business Management at Harvard Business School—and come back to us complete with cap and gown and a broad Harvard accent.

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